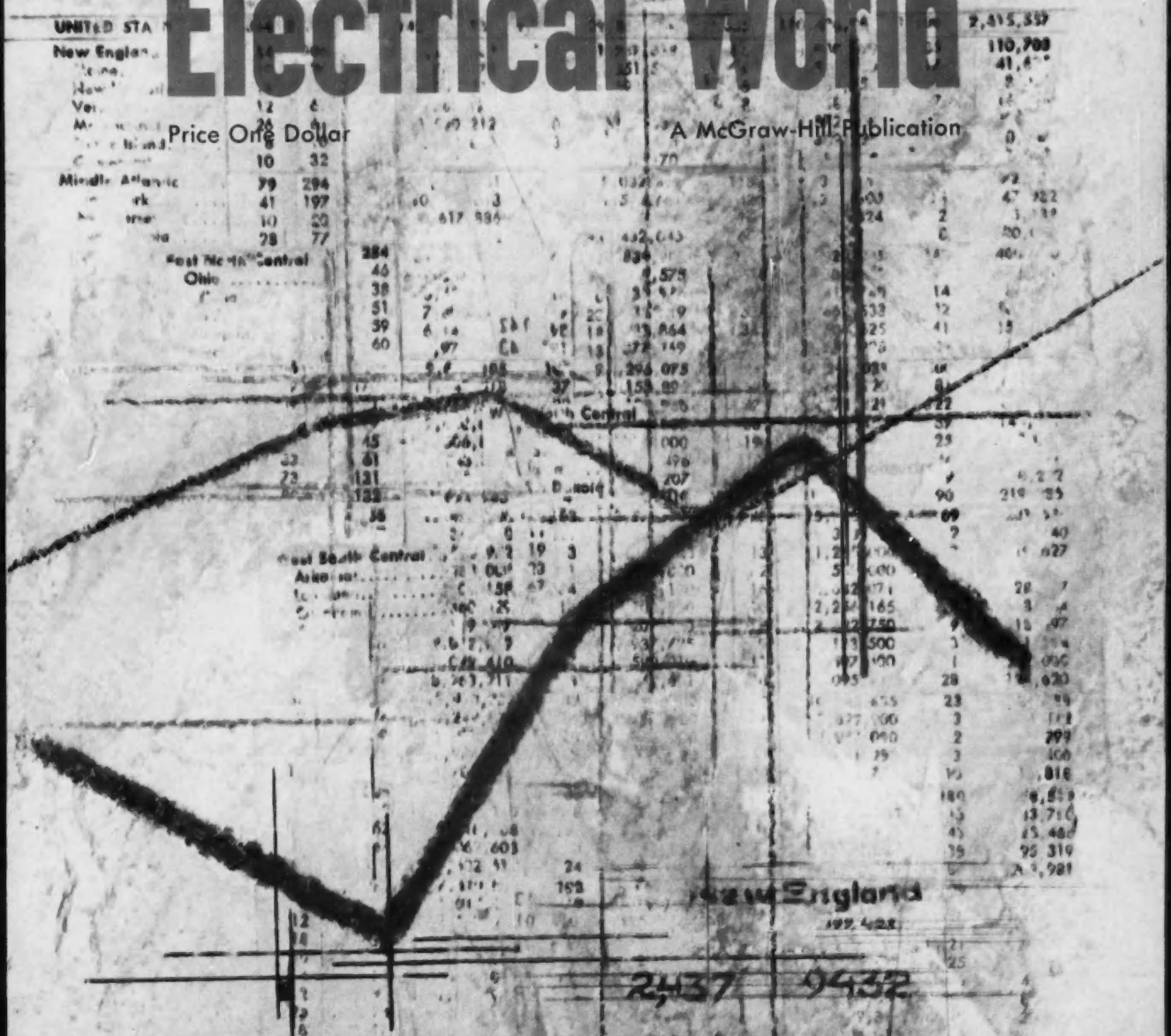
• The Electrical Industry's Weekly Magazine February 29, 1960

Electrical World

Price One Dollar

A McGraw-Hill Publication



Electrical World Industry Statistics

56TH ANNUAL REPORT

Part 2

UNIV MICROFILMS INC
EDITORIAL DEPT
313 N FIRST ST
ANN ARBOR MICH

Burndy underground connectors are still in service after 20 years, despite prolonged exposure to such hazards as dampness, oils and extreme ambient temperatures. To make sure that connectors withstand severe conditions even better than cables and protectors, Burndy *"Total quality control"* puts underground connectors thru whole series of tests, including these for the insulation alone:

Test	ASTM Spec. No.
Accelerated Aging	D572
Heat Resistance	D469
Oil Immersion	D421, D752, D471
Moisture Absorption	D469, D470
Corona Resistance	M114 (Burndy Spec. No.)
Specific Inductive Capacity	D469, D470
Volume Resistivity	D469, D470
Dielectric Strength	D149, D150, D257

Other components and the completed connectors must pass equally exacting tests. Only *Total quality control* can assure you of long life and unfailing performance in every underground connection.

BURNDY QUALITY CONTROL

concentrates

ON DEVELOPING BETTER ELECTRICAL CONNECTIONS

Burndy's *"Total quality control"* focuses a wealth of specialized engineering experience on electrical connections.

Every characteristic that can affect connector performance is checked, all the way from design thru pilot fabrication to quantity production. At each critical point, quality control engineers use appropriate techniques — like "looking into" connectors with radiography as well as dielectric and conductivity tests, mechanical and electrical performance testing like torquing and heat cycling, and sampling and other methods—to safeguard quality.

Total quality control assures the performance of the connections you install today, helps Burndy develop better connection techniques, connectors and tools.

Remember, Burndy is the *only* major manufacturer concentrating *all* its extensive facilities on the development of better electrical connections... your assurance of connectors that fit your electrical distribution system for tomorrow's increasing loads.

DESIGN, RESEARCH, TEST AND PRODUCTION LEADERSHIP

BURNDY

58-19

Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada

Electrical World

Vol. 153, No. 9 FEBRUARY 29, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

CURRENT EVENTS

Utilities Take Wait and See View on Indictments

Alleged price fixing on electrical equipment will have little effect on purchasing policies.....p 64

MANAGEMENT NEWSLETTER

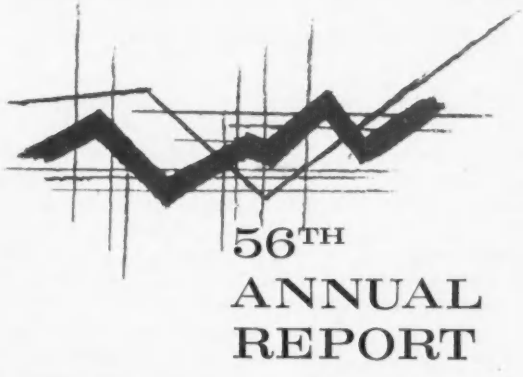
How About Music in the Office?

Background music is well-worth its cost, say many utilities that have tried it as a management technique.....p 143

Reports Recloser Operation

Two-way radio in pole-mounted transformer casing for giving remote alarm is set up for experiments.....p 69

Special Report



Electrical Industry Statistics—Part 2

Special 32-page report pictures utility business as of January 1. Twelve pages of tables indicate specific plans for capacity expansion during next three years and preliminary budgets for the next five years.

New Capacity Reported to EW.....p 72
Budgets: 1960-1964.....p 74
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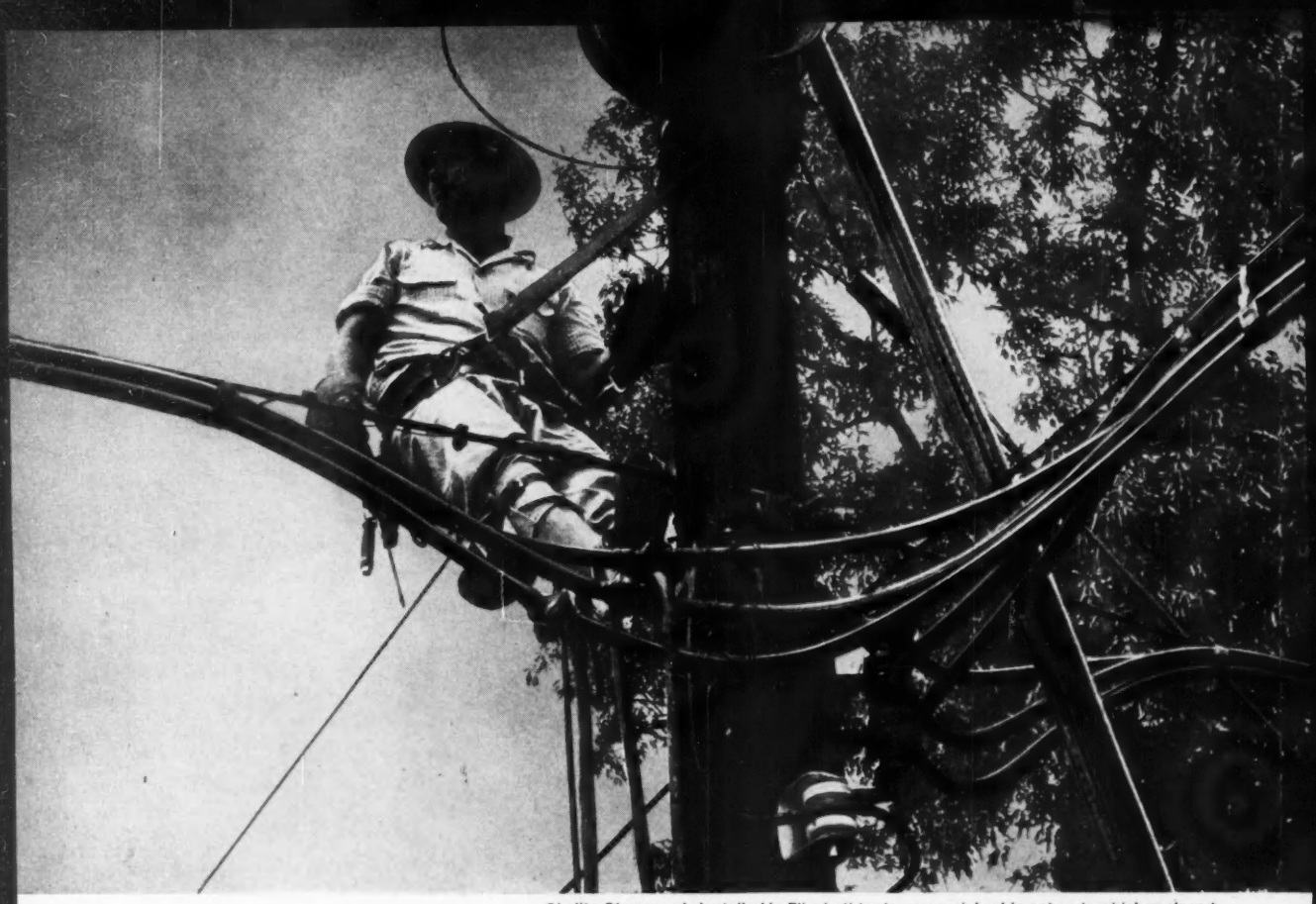

Okolite-Okoprene is installed in Elizabethton's new aerial cable network, which replaced an outmoded open wire system. Field spun to Copperweld messengers, the tough weather-resistant cables were specified both for 600-volt secondaries and 15 kv primaries.

Elizabethton, Tenn. replaces open wire system with Okolite-Okoprene aerial cable, gains needed capacity

Entire system can be converted to future underground use.

The City of Elizabethton, Tenn., has replaced the cluttered, unsightly open wire system in its business district with a 1200-by-1700-foot Okolite-Okoprene aerial cable network that can be converted to underground service when required. Underground transformers and protectors are mounted on pole platforms for the present aerial system.

The new aerial cable network was designed to handle the system's growing load economically and efficiently. The open wire system had become overloaded, crowded and unsightly on the poles, with no further expansion possible. An underground system was not economically justified immediately. The aerial system was planned to fill present load needs with a minimum of confusion at a reasonable cost.

The Okolite-Okoprene cables offer improved appearance and voltage regulation, require less space to handle the increased load and provide high resistance to weather and mechanical damage. In addition, when further system growth requires conversion to underground, they may be reinstalled simply without complicated lead splices or other costly procedures.

Allen & Hoshall of Memphis, the consulting engineers, working with system manager John F. Meagher, specified Okolite-Okoprene both for 600-volt secondaries and 15 kv primaries because of previous experience with Okolite-Okoprene's resistance to weathering and mechanical injury.

The new aerial system, part of a $120,000 expansion program by Elizabethton Electric System, made Elizabethton the first city of its size (pop. 10,754) in the United States with such a network.

At Elizabethton, as elsewhere where the *best* available cables are called for, Okolite-Okoprene was the logical choice. For the full story on Okolite-Okoprene, contact your Okonite representative or write for free bulletins on all applications of Okolite-Okoprene to The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

7277

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LETTERS

Raising Common Equity

To the Editor:

With reference to the matter of raising common equity through the medium of rights, may I say that the Management Newsletter in your issue of Feb. 1 covered this subject in a comprehensive manner and, as you pointed out, the answer is neither black nor white.

However, some observations from my many years' experience as an investment adviser, serving accounts ranging all the way from small investors to substantial institutions, may be of interest.

Firstly, there can be no question that a great many stockholders like to get rights and the psychology of a contact with a company in which they have a stake is of immeasurable value as a creator of good will. I can point to no better example of this than the vast army of loyal stockholders in American Telephone & Telegraph Co who anticipate the periodic emission of rights by that company with unbounded enthusiasm.

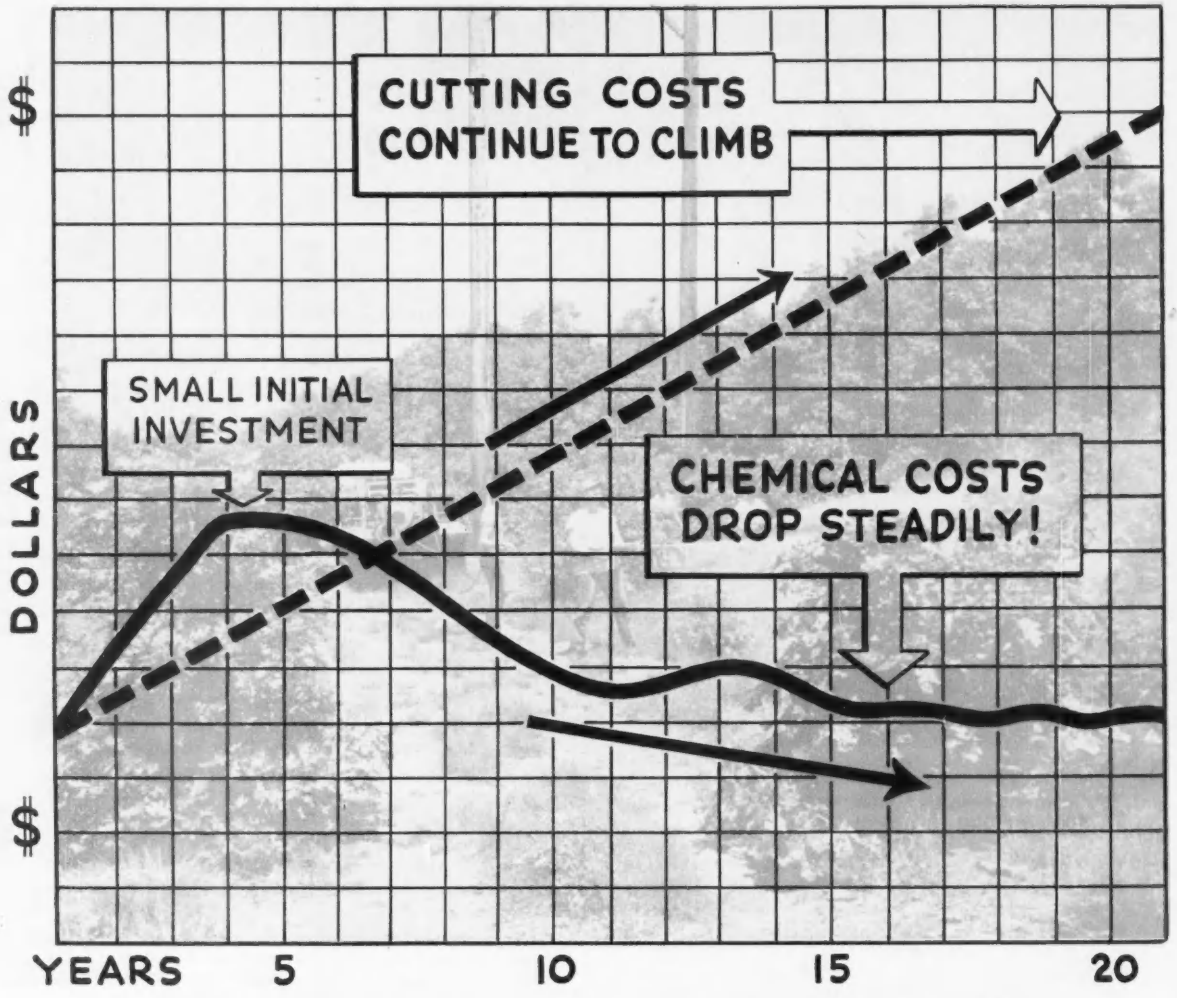
There is, however, another side to the coin and that is that where the ratio of the new securities to those presently outstanding either in amount or in price is such that the rights have a nominal value of only a few cents, the end product is in the order of a nuisance. Stockholders are inclined to view with disdain privileges that have only a nominal value because of their ratio to presently outstanding shares or the price thereof. Further, to brokers they are a burdensome nuisance. If sold, the commission does not usually cover the cost of handling the transaction, and if exercised, the service is usually provided without fee.

It may be that Ernest J. Howe, president of Rochester Gas & Electric Corp, has found a happy middle road to the problem. As you may be aware, his company has followed the example of Commonwealth Edison in declaring periodic stock dividends and maintaining a relative static cash rate. Of this Mr. Howe, in a presentation to the New York Society of Security Analysts, said, in substance, he saw no justification in paying an abundant cash dividend instead of retaining earnings and then asking stockholders to buttress common equity through the medium of subscribing to rights, using to some extent the proceeds of their dividends which, in the process, had been eroded by income taxes.

Arthur B. Retallick
Vilas & Hickey
24 Broadway
New York 4, N. Y.

► Our thanks to Reader Retallick for sharing these pertinent observations with our other readers. Electrical World editors have noted an increased interest among utility management men in both "rights" and stock dividends. A study is now underway on stock dividends. The Commonwealth story was detailed in EW, Sept. 15, 1958, p 87.

CHEMICAL BRUSH CONTROL CUTS COSTS!



REPETITIVE MANUAL BRUSH CUTTING means constantly *increasing* costs because every year the brush gets heavier and labor costs continue to climb.

CHEMICAL BRUSH CONTROL, however, can produce a *descending* cost curve, as indicated in the chart. After an initial application with experienced crews using proven formulations, and specialized equipment under dependable supervision, an ideal right-of-way can be maintained by occasional low-cost "spot" spraying.

An Asplundh program of chemical brush control can assure a right-of-way that is readily accessible, with desirable conditions for wildlife, complete acceptance by the public and good erosion control.

Our fourteen years of experience and research in chemical brush control, plus nation-wide service, complete insurance protection and superior public relations, have made us leaders in chemical right-of-way work. We'll welcome an opportunity to discuss your problems in detail.

CHEMICAL DEPARTMENT

ASPLUNDH TREE EXPERT CO.
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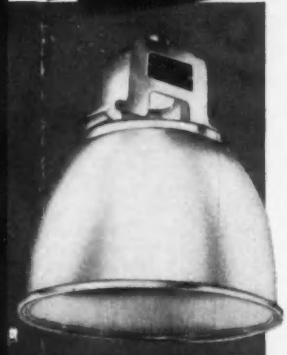
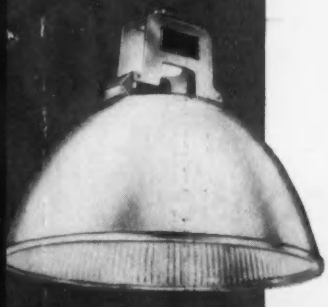
This New Book Presents the FACTS about HOLOPHANE Mercury Vapor Lighting for Industrial Plants

◀ *Typical Spread*



NO. 635—LOBAY



NO. 640—HIBAY

8 Case Histories reviewed... in this publication demonstrate the superiority of HOLOPHANE LOBAY® and HIBAY® prismatic glass reflectors with color-corrected mercury vapor lamps . . . Each case-report covers an actual installation in one of the nation's leading plants. It includes analysis of illumination data with references to mounting heights, spacing, lamps, footcandles, etc... Comparisons with other types of lighting systems are tabulated . . . In every instance, the results prove that Holophane mercury vapor lighting systems produce the most efficient, economical and serviceable illumination for today's industrial plants.

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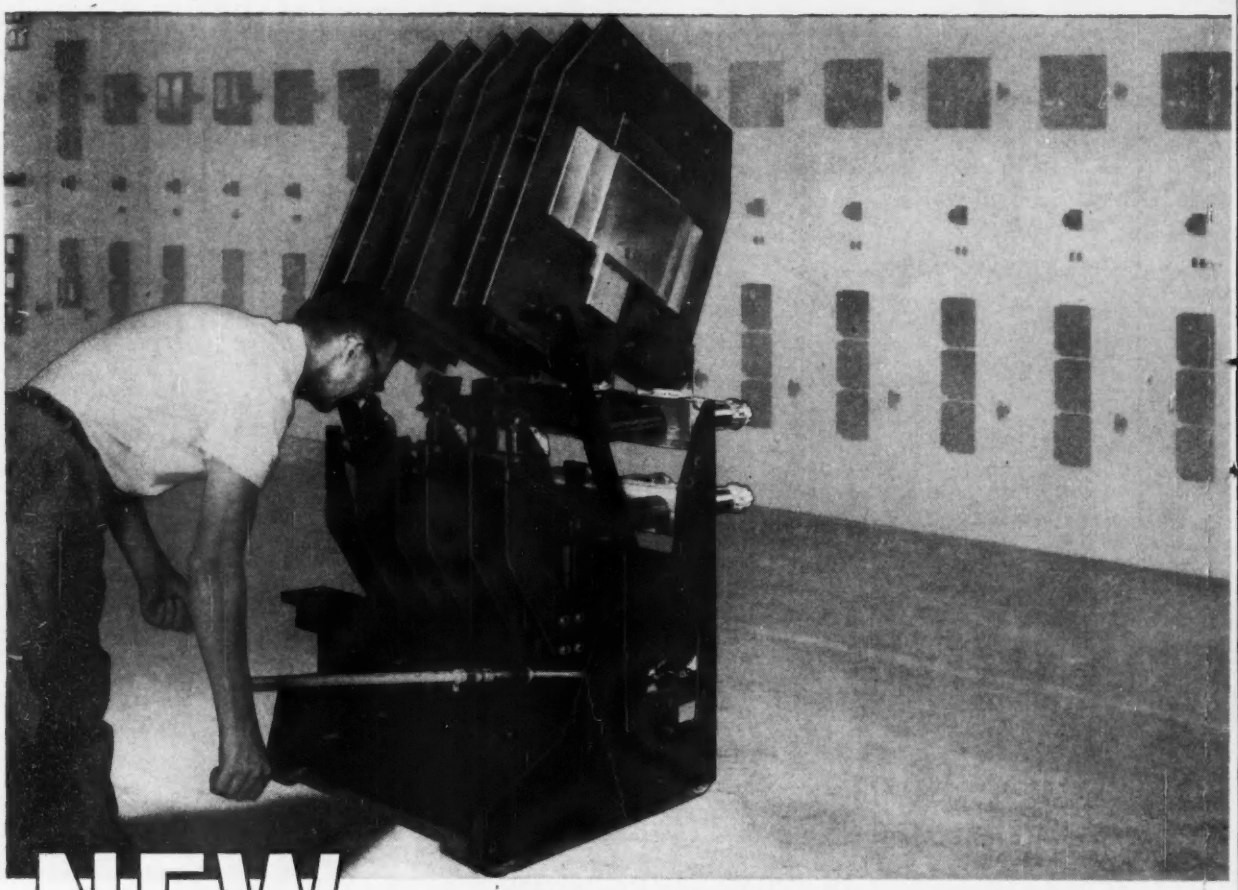

HINGED ARC CHUTE of type DH magnetic air circuit breakers permits tilting of chute for full accessibility of arc chute interior and contacts for inspection. ISOLATED CENTER COIL design employed in the DH breaker arc chutes provides more efficient arc interruption.

NEW...

DH BREAKER ADVANCES EXPAND CAPABILITIES OF METAL-CLAD SWITCHGEAR

Greater margins of safety and increased convenience of operation and maintenance . . . available with recent design advances in Westinghouse metal-clad switchgear

The HINGED ARC CHUTE of DH breakers affords ease of handling and facilitates inspection of arc chute interior and contacts. On smaller DH breakers, the arc chutes are tilted directly by hand. On larger breakers, the arc chutes are tilted by a compact, lightweight auxiliary device operated through the levering-in mechanism.

The ISOLATED, CENTER COIL DESIGN employed in the arc chutes of DH magnetic air circuit breakers permits more efficient arc interruption for any rating. This center coil design provides better magnetic field distribution . . . better insulation . . . increased field strength—all resulting in superior DH breaker performance.

LIMITRAK* INSULATION SYSTEM, a recent Westinghouse development, provides superior, balanced insulation in metal-clad switchgear. *Limitrak* glass polyester is used on DH breaker arc chutes, end channels and supports. *Limitrak* coating is employed on DH breaker bushings. *Limitrak* design is incorporated on porcelain bus supports of the metal-clad switchgear housing. Westinghouse *Limitrak* has been proved by test to be 300 times more track resistant than ordinary grades of glass polyester, and is also highly flame retardant. Get complete information on these Westinghouse metal-clad switchgear developments from your Westinghouse representative. *Trade-Mark

Quality Westinghouse metal-clad switchgear offers more value in continuity of service and economy of operation

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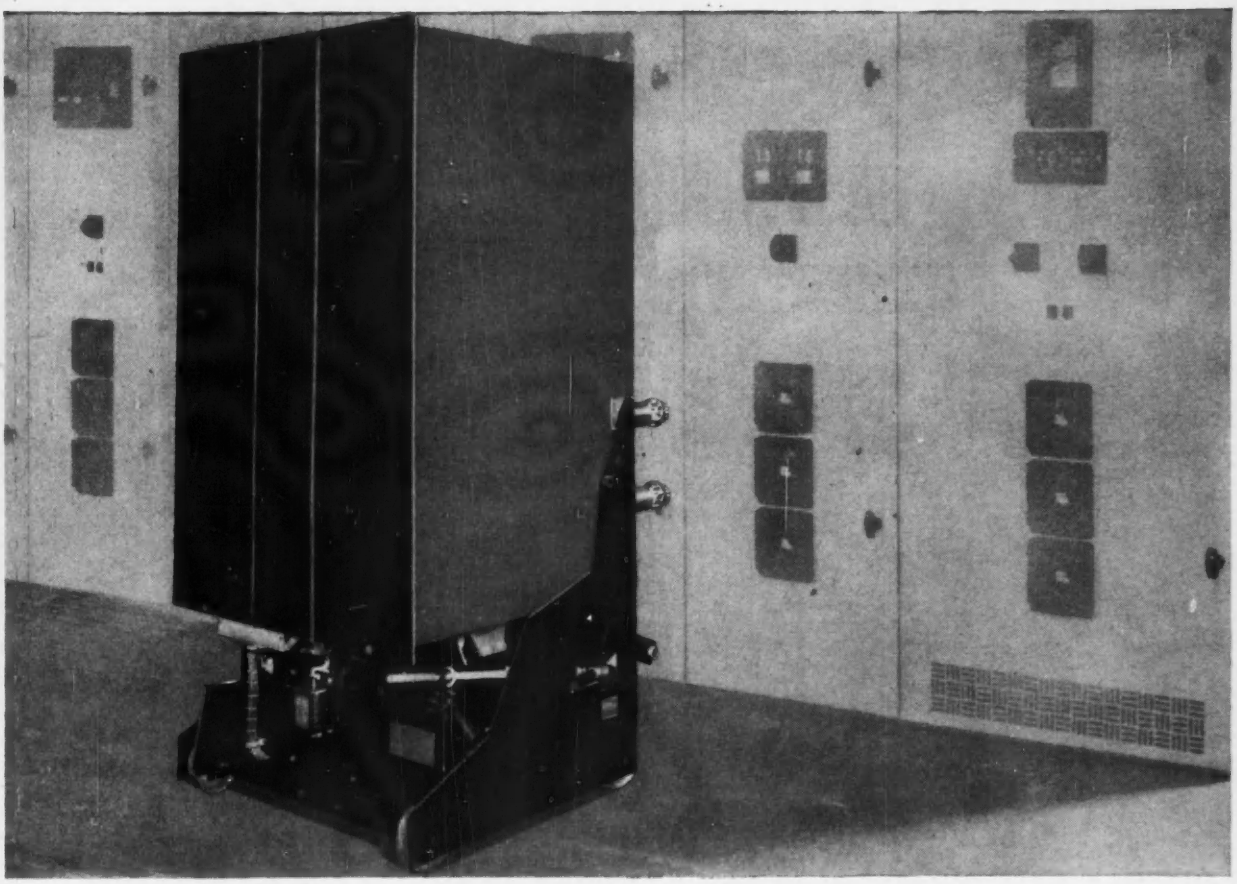
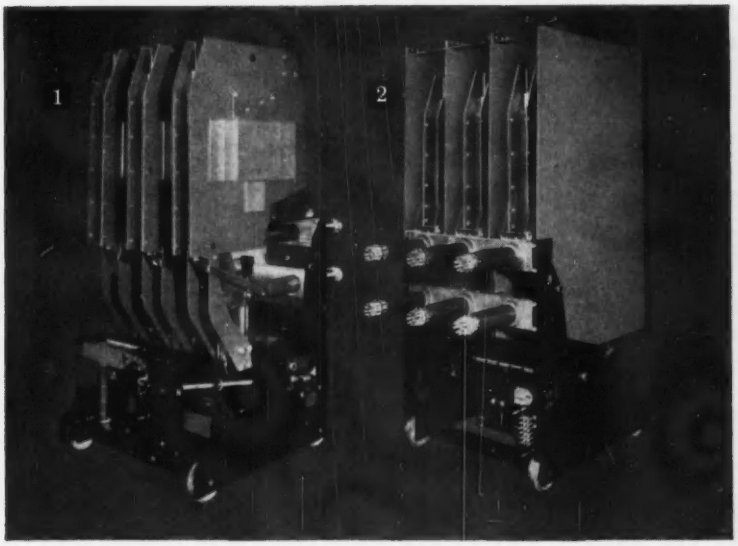
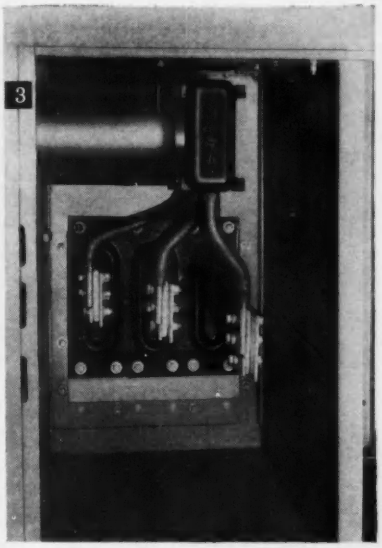


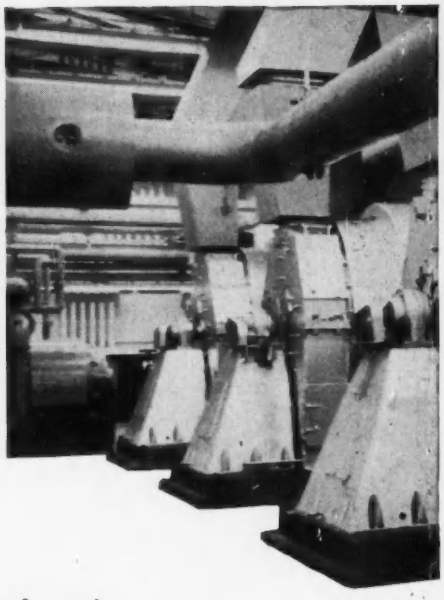
Completely assembled DH breaker, ready for installation in the metal-clad switchgear stationary structure.





Limitrak Insulation System is employed . . . **1** On DH breaker arc chute sides, end channels and supports. **2** On DH breaker bushings. **3** On bus supports of metal-clad switchgear housing. J-60975

With RILEY PULVERIZERS Installed In Your Plant

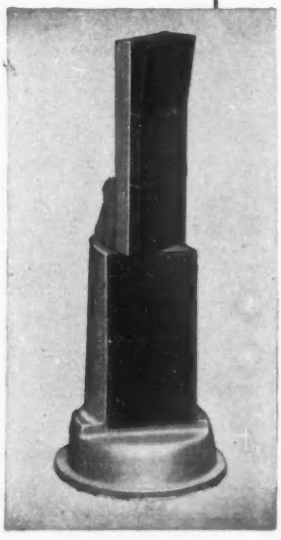


Silence is Golden

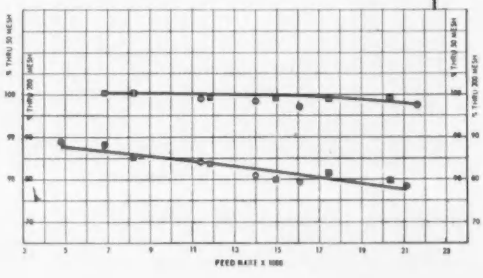
... Because Riley Pulverizers Operate Quietly

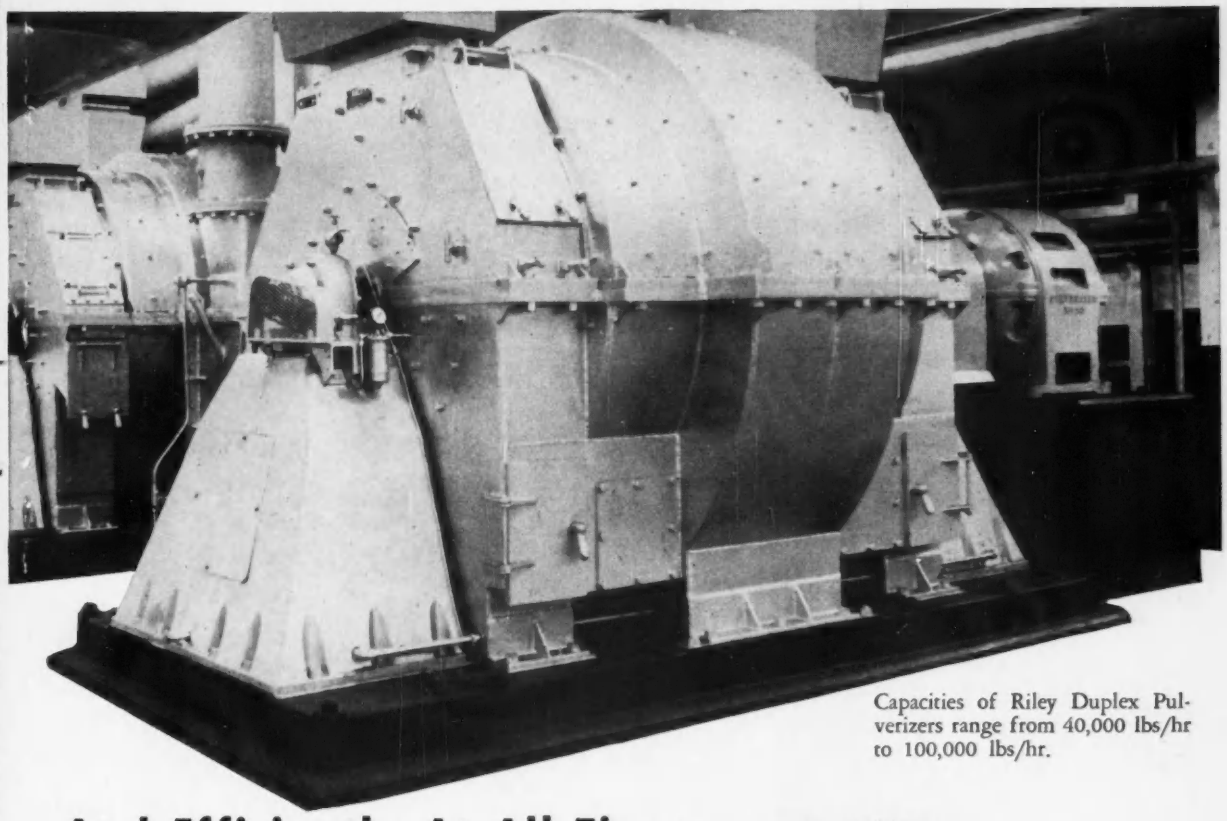
Other Advantages of Riley Pulverizers

- Wide fuel type range
- No loss of capacity with wet coal
- Ease of maintenance — minimum lubrication
- No adjustment needed to sustain fineness
- High primary air temperatures are used
- Sustained high fineness with tungsten carbide faced pulverizing elements
- Ease of automatic regulation
- Low power consumption
- Explosion proof
- Compact design, low foundation cost
- Rejections easy to remove
- Pressurized operation
- Wide capacity selection from 3,000 lbs/hr to 100,000 lbs/hr



At left is a typical pulverizing element faced with high grade erosion resistant tungsten carbide. At right are the results of fineness test conducted on a duplex type pulverizer. Test #1 ○ before elements were replaced; test #2 □ after new elements were installed. Results show no appreciable drop in fineness and capacity in either case.

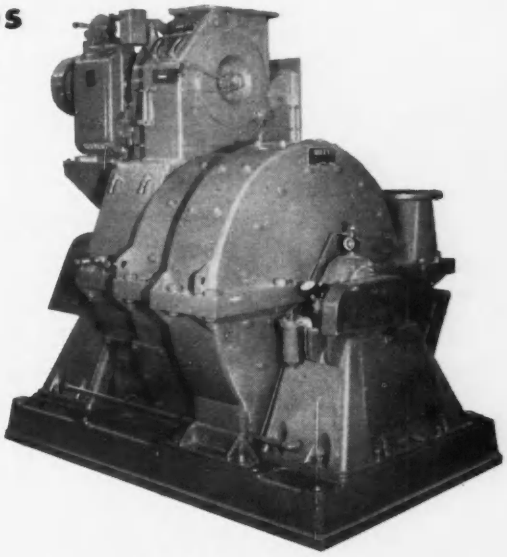




Capacities of Riley Duplex Pulverizers range from 40,000 lbs/hr to 100,000 lbs/hr.

And Efficiently At All Times

The Riley Pulverizer reduces coal to high fineness by attrition with no metal-to-metal contact . . . coal particles are reduced in size by impact against rotating and stationary pulverizing elements . . . *the action is soundless* . . . perfect balancing of all rotating elements assures smooth vibration-free operation. Visit one of the hundreds of plants using Riley Pulverizers . . . you'll be amazed at how comfortably you can hold a normal conversation in the pulverizer room.



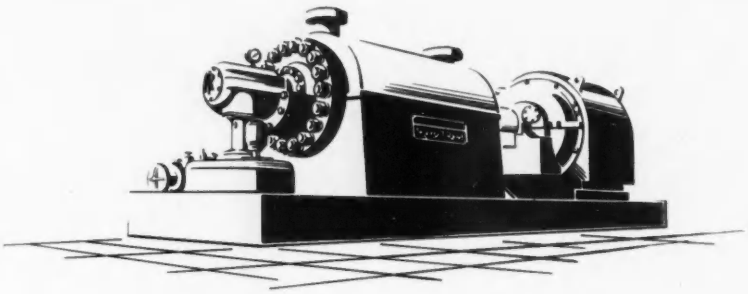
Single Riley Pulverizer capacities range from 3,000 lbs/hr to 30,000 lbs/hr. Unit is equipped with Riley metering coal feeder with magnetic separator.

You'll find all the many operating and design characteristics of Riley Pulverizers fully explained in a new Pulverizer Catalog. For your own copy ask a Riley Representative in one of these cities . . . Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Syracuse, Worcester.

RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

RILEY STOKER CORPORATION, WORCESTER, MASS.



superlatives

that demonstrate confidence in a high-pressure boiler-feed pump and its builder

LARGEST CAPACITY.....*7200 gpm.* Two record-breaking 7200-gpm pumps with discharge pressure of 4550 psig, for two 450,000-kw generating units.

HIGHEST PRESSURE.....*6500 psig.* Two half-capacity units, each consisting of three pumps in series, with discharge pressure of 6500 psig, for a 325,000-kw station.

HIGHEST HORSEPOWER.....*23,000 hp.* Two large capacity, high-head pumps, each driven by a 23,000-hp steam turbine, largest ever built for boiler-feed service.

LARGEST GENERATING UNIT.....*500,000 kw.* Two turbine driven half-capacity pumps, each handling 4000 gpm at 3108 psig discharge, at 6600 rpm for world's first half-million kw generating unit.

GREATEST ACCEPTANCE.....*Ingersoll-Rand* has built far more high-pressure boiler-feed pumps than any other manufacturer – including many *high-speed* units for generating stations. These superlatives demonstrate industry's confidence in I-R Class CHTA pumps, and in Ingersoll-Rand's ability to design and build to any requirements – even those that go beyond previous industry experience. For maximum dependability and long-range economy, specify boiler-feed pumps by Ingersoll-Rand.

Ingersoll-Rand

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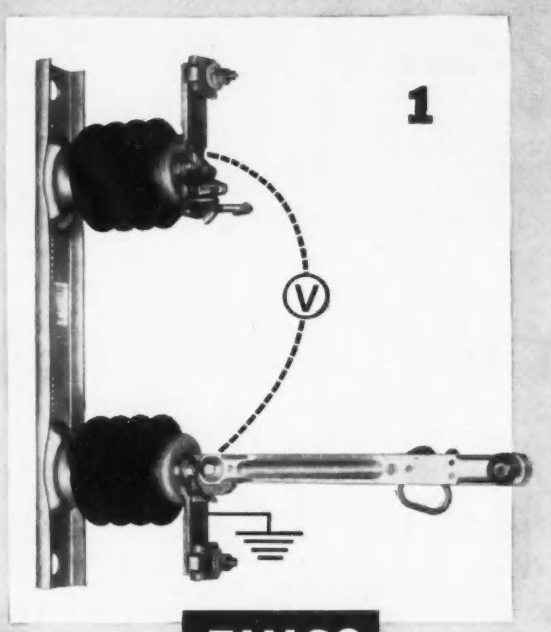
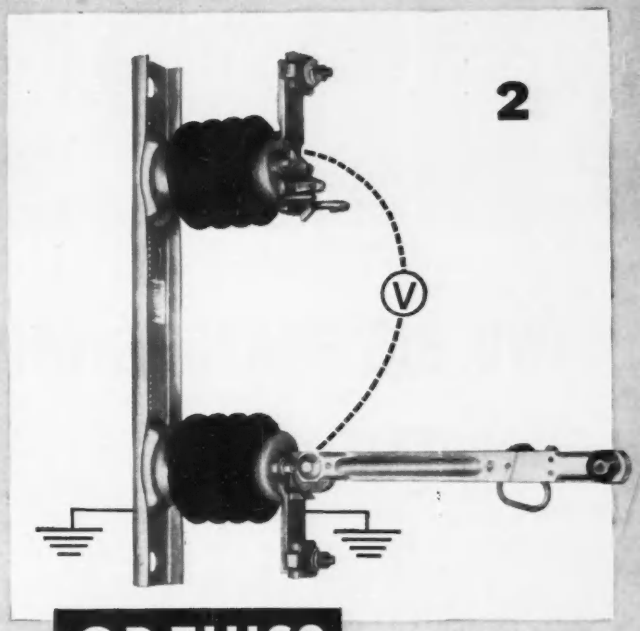
COMPRESSORS • GAS & DIESEL ENGINES • PUMPS • AIR & ELECTRIC TOOLS • CONDENSERS • VACUUM EQUIPMENT • ROCK DRILLS

Q: Which Test Shows a 95 Kv impulse withstand for S&C's 15 Kv LOADBUSTER DISCONNECT?



THIS?



OR THIS?

A: *Both confirm 95 kv for S&C's* LOADBUSTER DISCONNECT.

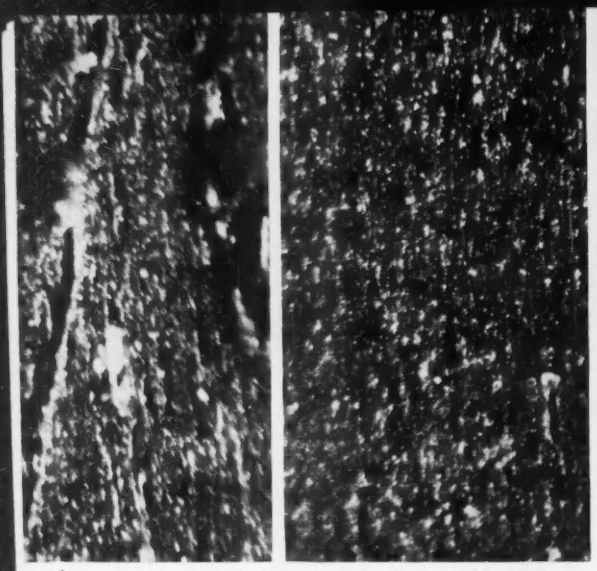
Test 1 is a less rigorous test. With the base "floating," conventional disconnects can often meet the 95 kv test. But this is an unrealistic condition, for in actual installations the base may be grounded . . . deliberately or not. A disconnect may be mounted on steel, or—even if on a crossarm—wet weather may wash out the "margin."

Test 2 with *base grounded* presents two parallel paths to ground. Under this severe condition S&C's Loadbuster Disconnect meets a full 95 kv impulse withstand.

There are no established AIEE or NEMA standards for this class of disconnect. Nonetheless for lineman safety S&C chooses to meet test 2, another "extra" at no extra cost.

Descriptive Bulletin 721 gives the full story on this remarkable disconnect. Bulletin 721 tells, too, how you can get low-cost load switching anywhere on your distribution system by using this disconnect with LOADBUSTER (the portable loadbreak tool). Write to S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill.

S&C ELECTRIC COMPANY



Above you see magnified sections of ordinary cable insulation (left) and Anaconda Butyl (AB) Cable insulation (right).

These screens, used in the extrusion head to entrap possible contaminants, are so fine they actually hold water.

TWO BIG REASONS WHY ANACONDA BUTYL (AB)

1. SPECIALIZED DEVELOPMENT

Because Anaconda was the first to develop butyl-insulated cable—and because butyl handles differently from other rubbers—many problems came up during development. Here are some examples—and how Anaconda engineers solved them.

A mixing problem: Like all raw rubbers, butyl in its raw state is a practically useless material. So it's mixed with specially selected additives and ingredients. Because it is very difficult to disperse these ingredients in butyl, Anaconda had to develop an entirely new mixing process and separate facilities to avoid contamination. Look at the comparison photos and see how successful it is.

A shielding problem: To eliminate laborious and time-consuming cleaning of insulation surfaces, Anaconda developed a semiconducting tape* which firmly adheres to the insulation—and yet is easy to remove during splicing and terminating.

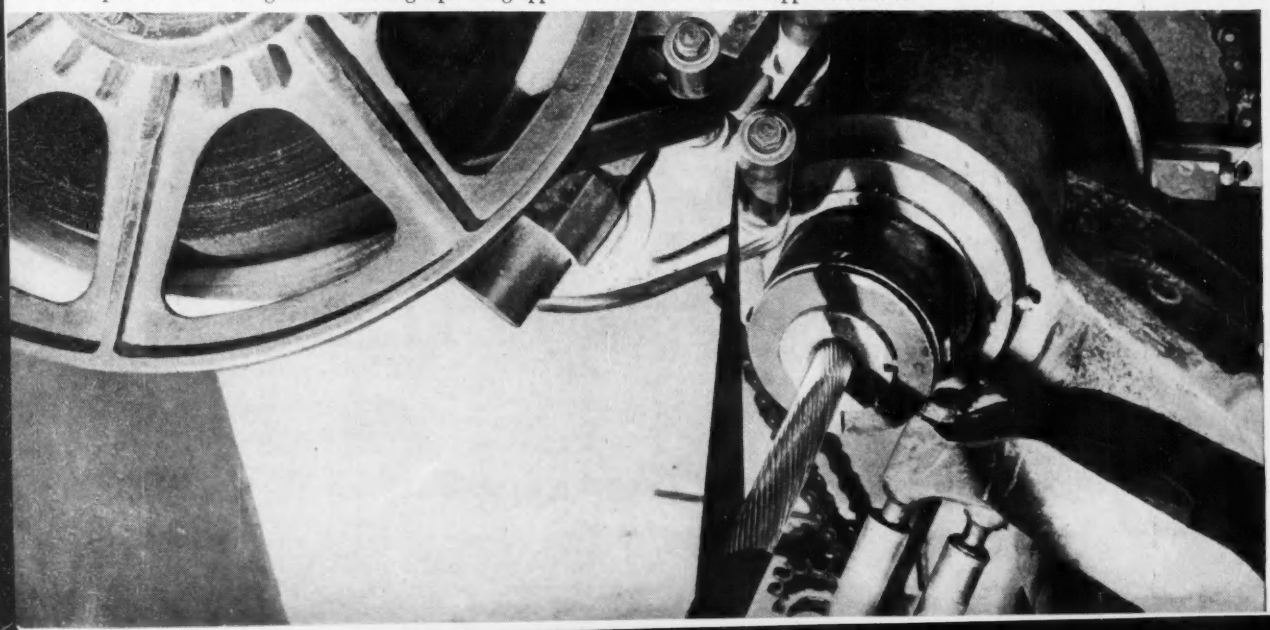
Even a vulcanizing problem: Ordinary vulcanizing equipment might have a tendency to deform butyl insulation. So Anaconda developed huge vulcanizing tanks which admit steam faster, vulcanize quicker and eliminate distortion.

These few examples show you the types of problems Anaconda engineers were up against. Their solutions help show you why you can be sure Anaconda Butyl (AB) Cable is the finest cable you can buy.

2. SPECIALIZED MANUFACTURE

Anaconda's new Marion Mill was designed to handle only one product—Anaconda Butyl (AB) Cable.

Close-up of semiconducting strand-shielding tape being applied to 500-Mcm tinned copper conductor.



An Anaconda development—semiconducting tape—adheres firmly to insulation, yet removes easily, facilitating splicing and terminating.

MEANS RELIABLE HIGH-VOLTAGE CABLE

The men behind this highly specialized equipment have but one job . . . to study and improve the design and manufacture of rubber-insulated high-voltage cable. Here are a few of the many places where they built precision right into the production line.

Insulation purity: For extra protection against contamination, the unvulcanized Anaconda Butyl is passed through a series of screens, one of which is so fine it will hold water.

Strand-shield taping: For better equalization of internal electrical stress, Anaconda applies a special fine-mesh semiconducting tape under the insulation of all stranded high-voltage cables.

Vulcanizing in lead: Conventional lead presses must stop periodically for refilling—severely heating up and often damaging the cable section in the die block, so Anaconda extrudes lead continuously. In the next step, exceptionally large drums are used for vulcanizing in lead to eliminate distortion of jackets and insulation.

These few examples help show you that the manufacture of Anaconda Butyl (AB) is highly specialized, highly precise—and why Anaconda offers you the big advantage of consistent high quality.

*Pat. applied for 60237

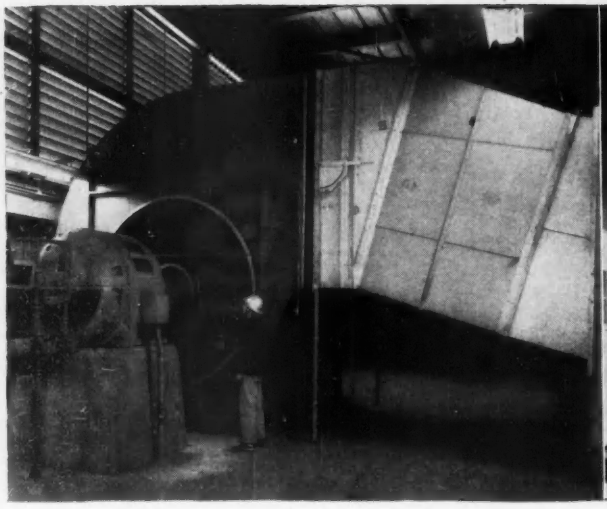
ASK THE MAN FROM

ANACONDA®

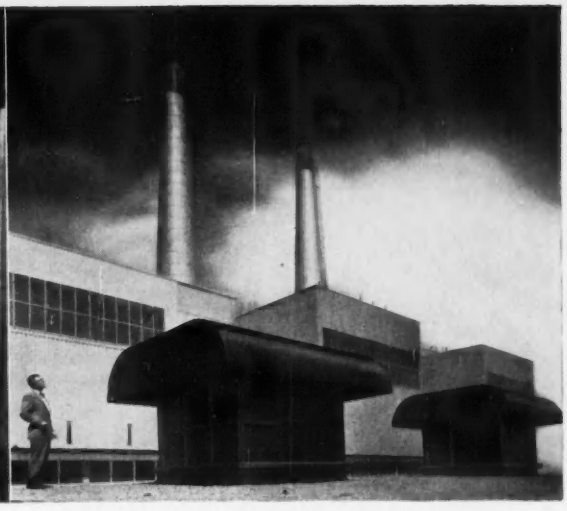
ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

Huge reel entering large vulcanizing tank which vulcanizes cable quicker than conventional methods, eliminating distortion of insulation.

How do you plan to ventilate and heat your power plant?



WITH CENTRIFUGAL FANS?



WITH POWER ROOF VENTILATORS?

Both methods have their advantages. The type fan you select will naturally depend on the circumstances encountered in the layout of your station. To meet these requirements, "Buffalo" offers power roof ventilators, centrifugal fans and make-up air units well suited to the task. Above are two typical "Buffalo" boiler room and turbine room ventilation installations.

"Buffalo" Centrifugal Fans — These quiet, efficient, non-overloading fans have proved an excellent choice for boiler house ventilation. If desired, hot air may be ducted to other areas as needed. "Buffalo" Centrifugal Fans provide completely stable performance from free delivery to shutoff. Turbulence is reduced to a minimum by unique "Buffalo" design features. All wheels are factory-balanced to minimize vibration. Rugged construction throughout gives a long life of trouble-free service. Write for full details in Bulletins F-104 and F-201.

"Buffalo" Power Roof Ventilators — These dependable "packages" exhaust high volumes of hot air from large areas. They save money from the start, because little, if any, expensive duct work is required. Peak-efficiency "Buffalo" fans insure minimum operating costs. Installation does not interfere with valuable floor space. "Buffalo" Sky-Vent Power Roof Ventilators are complete units, quickly and easily installed. Capacities 1,000 to 250,000 CFM. Assembled packages include fan, motor, housing, roof curbing, stack and hood. Can also be arranged for supply with heating coils and dampers. Write for Bulletin FM-2345.

Your nearby "Buffalo" engineering representative will be glad to work with you on your boiler room ventilation problems. Phone him today, or write us direct.

"Buffalo"

BUFFALO FORGE COMPANY Buffalo, New York

Buffalo Pumps Division, Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

RUGGED YEARS AHEAD . . .

that's why the job demands

SLIPKNOT

Overhead or underground, every splice in a distribution line must be final, safe and *permanent.* SLIPKNOT PLASTIC ELECTRICAL TAPE, 7- or 10-mils thick, *handles easily, conforms readily,* and *snugs* and *stays down.* That's why it's found in the hands of the country's most experienced linemen — and *in all the best splices everywhere.*

With adhesive permanently anchored to vinyl base, with controlled tension for proper stretch without dangerous thinning — with absolute conformity in mile after perfect mile — no wonder SLIPKNOT is the specified plastic tape.

Try a roll today — with our compliments.

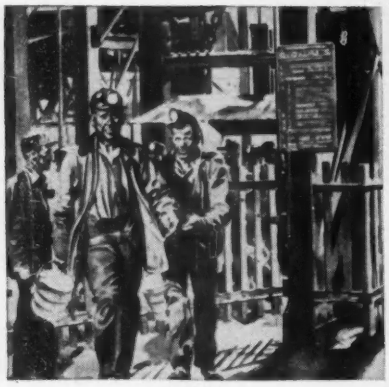
TAPES BY
SOLD ONLY THRU RECOGNIZED DISTRIBUTORS
PLYMOUTH RUBBER COMPANY, INC.

Samples for testing, with complete specification data, available on request. Please specify 7-mil or 10-mil. Write Division U on your business letterhead.

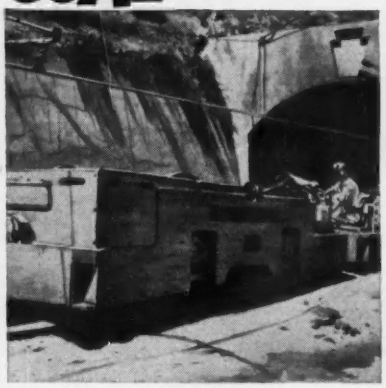
PLYMOUTH RUBBER COMPANY, INC.

QUALITY SINCE 1896 *Makers of* **SLIPKNOT FRICTION TAPE** — *most widely used in the world* CANTON, MASSACHUSETTS

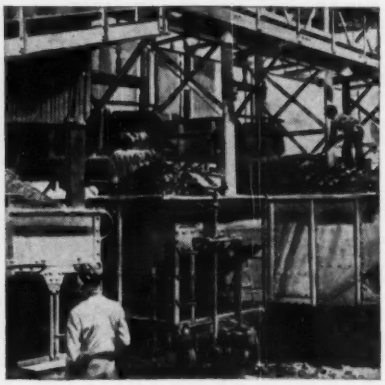
BEACON COAL HAS WHAT IT TAKES



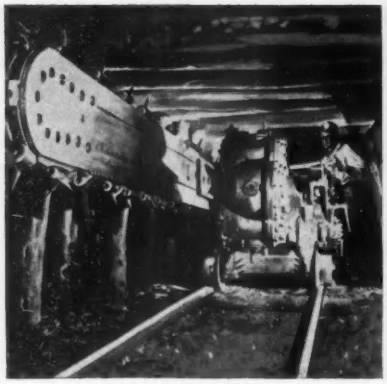
MEN



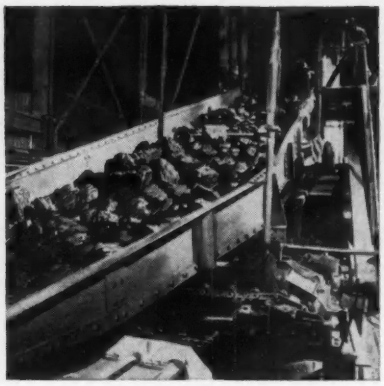
MINES



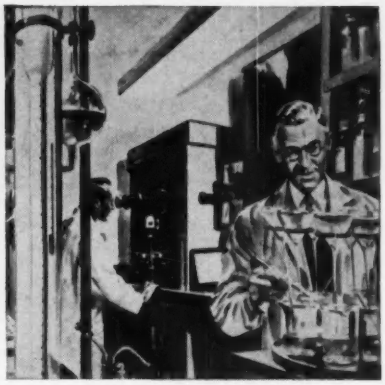
CAPACITY



EQUIPMENT



PREPARATION



QUALITY CONTROL

To give the electric utility industry the coal, the assurance, and the service it needs

Next time you write the specifications for the kind of *coal* you want, why not jot down the specifications of the kind of *supplier* you would like to have . . . and see how we measure up!

We have been serving electric utilities for many years, and feel that we know intimately their needs and problems. Our 15 mines provide a variety of coals, and a potential that can deliver up to 15 million tons a year at need. Modern mechanization plus skilled miners equip us to gear production to virtually any emergency you might encounter, and mine location on a number of major railroads gives wide latitude in routing. We maintain close check on quality in our laboratories. Our representatives are men who have made coal their life work and the serving of customers their highest aim. Finally, our past record, if you care to check it, provides complete assurance that you will get the coal you want, when, where, and as you want it.

EASTERN GAS AND FUEL ASSOCIATES

PITTSBURGH • BOSTON • CLEVELAND • DETROIT • NEW YORK
NORFOLK • PHILADELPHIA • SYRACUSE

For New England: New England Coal & Coke Co., For Export: Castner, Curran & Bullitt, Inc.

BEACON COAL

EASTERN GAS AND FUEL ASSOCIATES — BEACON COAL

The Electrical Week

LATE NEWS ▶ **Many co-ops could absorb a cost-of-money increase** without changing their rate structures the slightest, according to REA Administrator David Hamil at NRECA's 18th annual meeting in St. Louis. He also urged co-ops to "take advantage of the President's recommendation for a mutually owned financing institution to meet (their) capital needs." General Manager Clyde Ellis, Rep Carl Albert (D-Okla.), Sen Olin Johnson (D-S.C.) and others attacked the administration's tight money and high interest policies. NRECA's extensive national advertising and public relations program, with schedules in leading national magazines, is underway.

State regulation of privately owned electric and gas utilities has been recommended by the Minnesota Legislative Research committee. Exempted would be REA co-ops and municipal systems. Northern States Power, Minnesota P&L, and Otter Tail Power favor the measure. St. Paul, Minneapolis, and Minneapolis Gas Co are opposed.

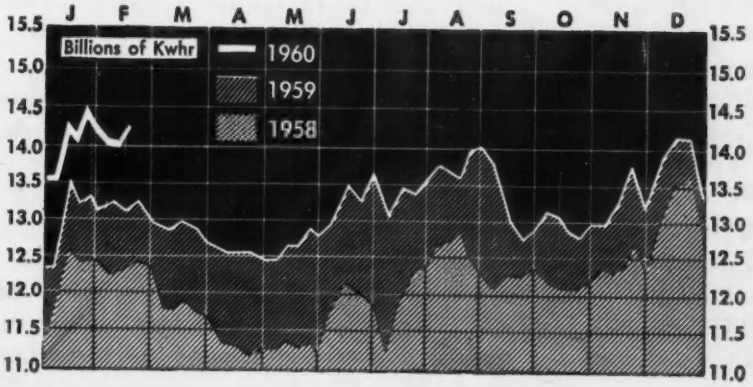
Annexation of a manufacturing area by Forrest City, Ark., has taken some service area from Woodruff Electric Co-operative. The PUC ruled that Woodruff has no recourse because the law exempts city-owned utilities from such actions. Arkansas P&L operates the system for Forrest City.

Arizona's attorney general's office says the state constitution prevents it from paying for relocation of utility facilities related to highway projects.

Management changes . . . Duquesne Light Co names R. W. Heller vice president-Sales Division succeeding George W. Ousler, retiring, who will join Edwin L. Wiegand Co as assistant to the president.

Obituary . . . F. M. Ives, 80, chairman of Boston Edison Co.

WEEKLY POWER OUTPUT—Up 7.3% (Week ending Feb. 20), Kwhr 14,226,000,000



Per Cent Change From Previous Year

	Feb. 6	Feb. 13	Feb. 20
Total U. S.	+ 6.1	+ 7.0	+ 7.3
New Eng.	+ 4.7	+ 3.1	+ 3.2
Mid. Atlan.	+ 6.4	+ 5.8	+ 6.6
Cent. Ind.	+ 7.2	+ 8.8	+ 7.7
West Cent.	+ 2.4	+ 3.9	+ 5.4
Southeast	+ 4.5	+ 9.2	+ 9.2
South Cent.	+ 7.9	+ 7.5	+ 9.5
Rocky Mount	+ 3.5	+ 4.4	+ 5.5
Pacific			
NW	+ 5.7	+ 2.3	+ 4.7
SW	+ 9.6	+ 6.0	+ 6.6

Seasonally Adjusted Index 268.9

Week Ago 251.1 Year Ago 265.2

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ **Utilities are taking a "wait-and-see" attitude on price fixing** charges made by Philadelphia grand jury **(p 64)** . . . Elmer Lindseth offers some pointed comments on the U. S. atomic energy program **(p 66)** . . . Russia plans three 1,400-kv lines in next 20 years **(p 67).**

SPECIAL REPORT 56TH ANNUAL STATISTICAL REPORT PART 2 ▶ **Highlights of Part 2 of EW's 56th Annual Statistical Report (p 77):** U. S. utilities plan to add 35,425 Mw of capacity in the next three years, and are planning another 22,962 Mw after '62. Other highlights:

- **Energy sales (p 76)** jumped 10.1% in '59. Breakdown: Residential—9.1% to 173 billion kwhr; Commercial—11.1% to 112 billion kwhr; Industrial—10.2% to 303 billion kwhr.
- **Average residential use** hit 3,577 kwhr, up 211 for the year.
- **Revenues** jumped to $10.5 billion, up 8.4%.
- **Installed capacity** climbed to 156.6 million kw at year-end, and shipments of electrical equipment climbed 11.2% to $21.5 billion.

ENGINEERING ▶ **Two-way radio reporting of recloser operation** by pole-mounted equipment is tested by Corn Belt Electric Co-op **(p 69)** . . . Roofless 30-to-50-Mva substations, used for Los Angeles, are economic and

Politics and Public Power

COMPOUNDING THE CONFUSION

The bitterness, confusion and just plain Washington politicking which have characterized the development of nuclear power in the United States stand a good chance of being compounded by a corresponding kind of strife on the state level.

The latest example of this was the recent eruption of New York State Power Authority Chairman Robert Moses concerning the role his authority should play in regard to A-power within the state.

Moses claimed that Gov Rockefeller—through his Committee on Power Resources and his Office of Atomic Development—is attempting to "freeze out (the) authority by indirection," (EW, Feb. 15, 1960, p 69). Moses was referring to a report recently submitted to the governor by these two committees, that utility members of the group had influenced fellow members heavily in favor of private A-power, so heavily in fact, that nothing is left to PASNY.

Moses said that the committee "reports propose to freeze out this authority by indirection, that is, by deliberately withholding permissive legislation." (Under New York law, the authority may build only hydro projects. It would require enabling legislation to put the state in the thermal or nuclear-plant business.)

Moses also said that "the authority does not seek to be the exclusive agency in the state in the atomic field, but rather to be in a position to contribute its share."

How well this squares with an earlier recommendation that the authority be "the state's agency responsible for the investigations and activities relating to the develop-

acceptable in residential and commercial territories (p 70).

PROCUREMENT & PRODUCTS ▶ **Manufacturers are reviewing and revamping their pricing policies as** a result of the recent federal grand jury indictments . . . Compact cars appearing in utility fleets around the country (p 110) . . . Babcock & Wilcox ships pressure vessel to Yankee A-plant . . . Reactor vessel for Elk River Co-op A-plant on its way (p 114) . . . Substation transformers in 15-kv class have 95-BIL instead of 110-BIL insulation on high-voltage side . . . Motor control center for central stations provides group central control (p 122).

MANAGEMENT ▶ **Is background music just another office "frill,"** or a management aid that will repay its cost? Many utilities look upon it as one of the least expensive ways of increasing office efficiency (p 143).

SELLING ▶ **Good lighting moves merchandise.** Pacific G&E proved it to commercial customers, architects and others with a traveling exhibit (p 134).

NEXT WEEK ▶ **Read a full report of NRECA's 18th Annual Meeting** held in St. Louis.

ment, building and operation of nuclear power plants" is open to question.

This earlier recommendation was made by Maj Gen T. F. Farrell, a consultant to PASNY, in a report to the authority made in November, 1958. While it is true the report was made to the authority, and not by it, the authority released it to the press (EW, Dec. 8, 1958, p 66), and the impression was widely gained that Farrell's recommendations, in fact, represented the authority's position also—a position that implied much more for it than merely being "in a position to contribute its share."

Critics of Moses' stand are asking whether it is really necessary to add another agency—with all its bureaucratic ramifications—to the already complicated procedures that a would-be builder of an atom plant, whether public or private, must go through in dealing with the Atomic Energy Commission, the Congress, and other interested federal parties.

Surely, they point out, the AEC, with its monopoly of nuclear fuels, its licensing powers covering everything from probable costs to public safety, is adequate to handle the problems.

But, regardless of who is right or what the outcome is in the PASNY case, one thing is certain: It is not likely to help clarify the already confused A-power situation. And it follows that it is not likely to speed the day when nuclear power will become commercially feasible.

It seems pertinent, therefore—especially in view of the recent severe criticism of our nuclear program—that those who have accepted the responsibility for the success of that program realize that no one has anything to gain by compounding the confusion.

Nuclear Notes

Cleanup of radioactivity from an explosion of an Oak Ridge processing plant will cost the AEC nearly $350,000 and is expected to be finished this month. The blast occurred last November in the Thorex pilot plant where radioactive waste materials were converted into transuranium elements. Plant damage was $10,000 and contamination covered four acres. Decontamination included cleaning and painting of buildings, spraying of a roof with asphalt, resodding one-eighth acre, and replacement of 100 yd of asphalt roadway.

Three proposed amendments to AEC licensing regulations aim at easing private reactor construction. The first permits exploration and excavation at proposed sites without an AEC construction permit, but prohibits laying of foundations. Another proposes the issue of provisional permits where "there is reasonable assurance that the proposed site is suitable from a safety standpoint," even though design research remains to be done. The third will facilitate transition from construction to startup by providing provisional operating permits. AEC is publishing the proposals for public comment and contemplates adoption of all three.

Plans for a 200-acre atomic facility in south New Jersey are being studied by the AEC and state officials. They call for a medical center for research and treatment of radiation injuries, a plant for processing radioactive waste, and a fueling and servicing facility for nuclear-powered ships. The AEC hopes that private industry will operate the waste plant.

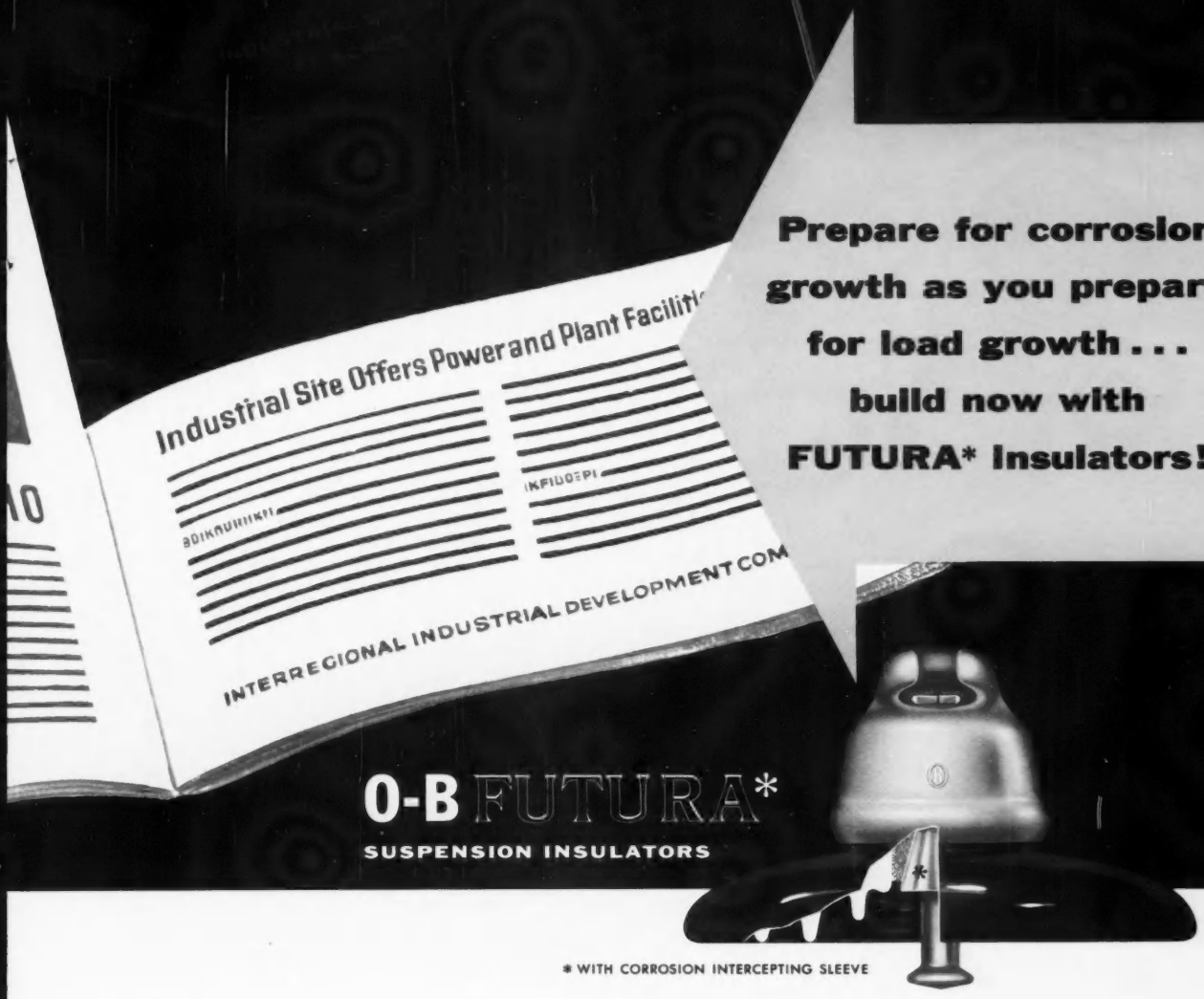
A second hole in the zirconium core tank of the Homogeneous Reactor Experiment No. 2 at Oak Ridge was discovered upon shutdown after 105 days of continuous operation. Cause of the ½-in. by 1½-in. fault, same size as the earlier one, was charged to a fuel concentration hot spot due to flow conditions. Reversed flow and hydrodynamic improvements should eliminate such spots before resumed operations.

Clarification of AEC policy on placement of contracts for research and development has been suggested by the Atomic Industrial Forum. The Forum recommends more effective communications between the AEC and industry and the establishment of a committee to discuss the research roles of industry, universities and AEC.

The 1960 Nuclear Congress and Atomic Exposition, sponsored by 28 leading technical societies, will be held April 4-7 in the New York Coliseum.

Graphite shrinkage has created a snag in the construction of power stations by Britain's Central Electric Generating Board. This occurs under the higher temperatures and fluxes of the center core regions and tends to cause structural instability, permitting vibration to interfere with control rod operation.

Corrosion is a growing problem!



Prepare for corrosion growth as you prepare for load growth . . . build now with FUTURA* Insulators!

O-B FUTURA*

SUSPENSION INSULATORS

* WITH CORROSION INTERCEPTING SLEEVE

The growth of electric power loads, whether industrial or residential, is almost inevitably accompanied by increasingly severe corrosion problems.

For load growth means not only higher transmission voltages, but greater atmospheric contamination, too - - and widely publicized studies have shown that both are factors in accelerating corrosive attack on suspension insulators.

It's simply wise planning, therefore, to prepare for corrosion growth at the same time you prepare for load growth.

You can do it *now* by specifying O-B Futura insulators for new transmission construction.

Futura has the extra margin of mechanical and electrical strength you'll need tomorrow - - and the built-in corrosion protection that makes sure this greater strength will be there when tomorrow comes!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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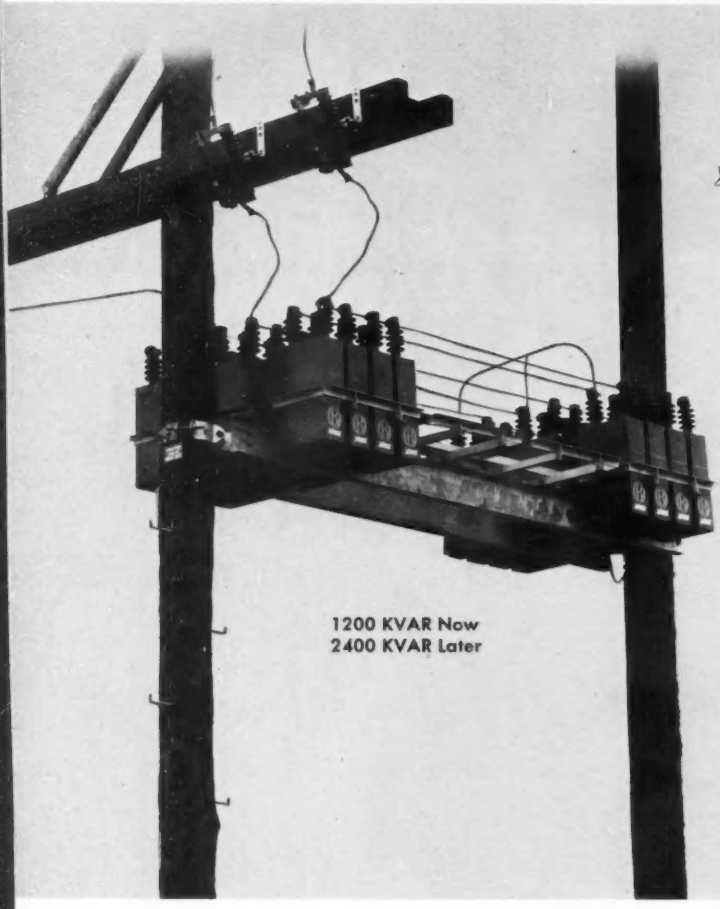
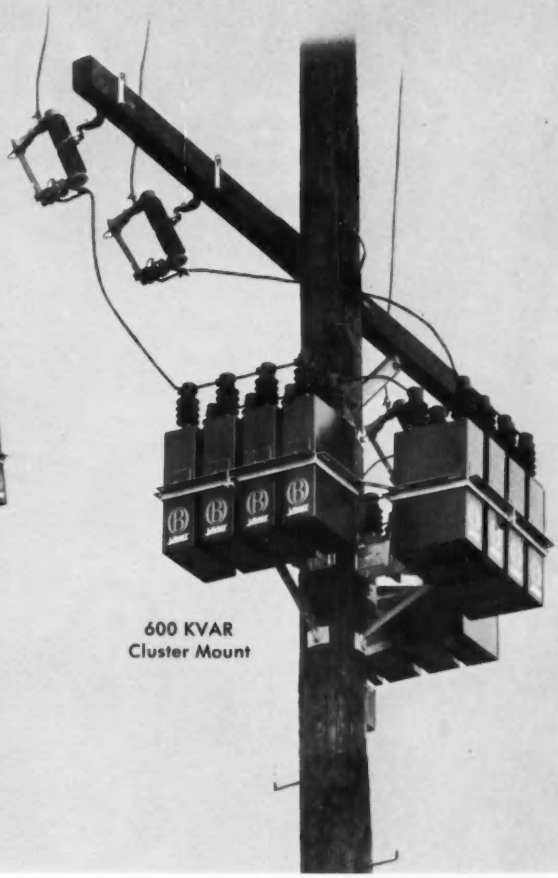
Get VAREX® in your choice



1200 KVAR Now
2400 KVAR Later



600 KVAR
Cluster Mount

There are literally thousands of ways to get the "pole-top benefits" of Varex capacitors installed on your system.

You can get O-B factory-wired equipments in a wide variety of convenient, ready-to-install arrangements - - including in-line, cluster, or rectangular - - switched or unswitched (with your choice of switch).

If you choose an O-B rack, like those shown on the right-hand page, you'll get several additional pole-top benefits - - a "boxed-in" rack design, for example, that shields and protects the units from physical damage during installation as well as in service. Available in steel or aluminum, O-B rack designs also feature convenient mounting brackets that give the lineman plenty of room for driving lag screws.

Biggest pole-top benefit of all, of course, is the exclusive Varex design - - the foil-cooled construction that eliminates tabs from the dielectric and limits maximum current density in the foil to one-fifth that of conventional designs.

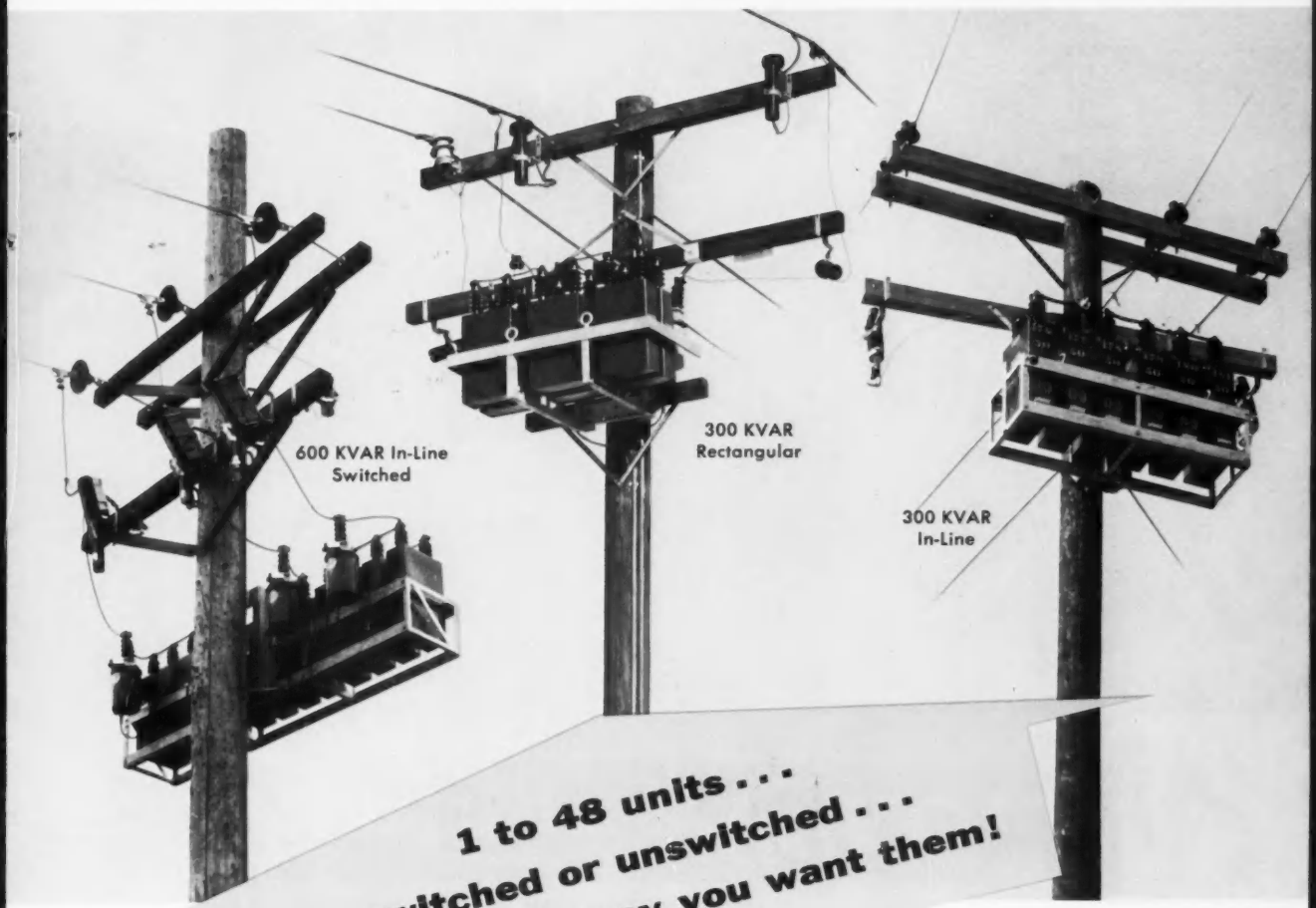
You can get this extra margin of safety from mechanical and electrical damage, this extra measure of service reliability - - any way you want it - - simply by specifying O-B Varex!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass ® HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

# of pole-mounted equipments



1 to 48 units . . .
switched or unswitched . . .
mounted any way you want them!

Check these "pole-top benefits" of Varex capacitors:

- Exclusive extended foil design for cool operation, long life.
- Terminals have stainless steel studs with strippable nuts to prevent overtightening. (Can be replaced with standard nut.)
- Both switch and capacitor terminals protected with rubber caps.
- Each unit has lifting eye between bushings for well-balanced, easy lifting to pole top and up to 12 extra inches of pole top clearance.
- Durable epoxy-resin finish and recessed bottoms protect units from weather and rough handling.
- 5-kv insulated cable used on all factory-wired equipments.

No fumbling with loose parts

The O-B 88500 Universal clamp has no loose nuts, bolts, washers, or keeper piece for the lineman to worry about. The reason, of course, is that there is no need to remove these parts in the first place.

A special spring clip holds the clamp open while the lineman uses both hands to form and bend the conductor. Then the nuts are tightened on the U-bolts. The clamping job is completed. Installation can be done entirely from one side, with the line hot or dead.

Made of galvanized malleable iron, the 88500 takes the full range of conductors from .20 to .50 inches in diameter. The very design of these clamps give them inherent high holding strength.

It's easy to see how the O-B 88500 clamp simplifies the lineman's job and makes deadending convenient and efficient. Just the time saved in speedy installation could well help pay for the clamps. Why not try them on your next deadending job and see for yourself their many advantages?

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass (B) HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

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This is for YOU!

Shows you why Clarage's airfoil fan tops all others where it counts...on-the-job

Stable high efficiency where it counts — under actual operating conditions.

That's what you *get* (not just expect to get) with the Clarage Type AF Dynafoil Fan...perfected for mechanical draft and heavy-duty applications such as industrial processes, conduit type air conditioning, tunnel ventilation.

Contact our nearest sales engineering office or request catalog on coupon at right.

Clarage Fan Company
Kalamazoo, Michigan

Please send me Catalog 859 describing Clarage Dynafoil Fans.

Name_____

Firm_____

Address_____

City_____ State_____

but only the Westinghouse Lamp has six

Despite similar appearance and ratings, these fluorescent lamps are *not* the same. One is a better lamp—and a better buy—because it's the only fluorescent lamp with all 6 advances described below. That lamp is made by Westinghouse. It costs you no more than any other leading brand—but it will give you years of trouble-free, efficient lighting.

1. **MORE EFFICIENT PHOSPHORS**—A special Westinghouse process selects Ultralume™ phosphor particles of a size proven to give more efficient lighting.

2. **BRIGHTER END TO END**—Lead wires are plated with super-hard Chrome Vanadium to make sure Westinghouse tubes *stay* bright, end to end.

3. **BUILT-IN "SHOCK ABSORBERS"**—Specially designed Westinghouse anodes act as buffers to cushion the terrific shock of electron bombardment and improve lamp life.

4. **"RAINCOATS" FOR RELIABLE STARTING**—Silicone "raincoats"

important advances that make it a better buy!

disperse moisture which can collect on exterior surfaces and prevent lamps from starting.

5. MIXED GASES—Westinghouse uses a precise mixture of certain rare gases, under exact pressure, to improve the light output.

6. TRIPLE-COILED ELECTRODES—To protect electrodes from the sudden electron bombardment when the lamp is first turned on. Emission material is quickly heated, fully protected.

Regardless of the type or wattage of fluorescent lamps you buy, you will get better value, more light for your money, and longer, trouble-free service if you specify and insist on Westinghouse fluorescent lamps. Westinghouse makes a complete line, from tiny 4-watt lamps for instrument lighting to the giant 96-inch Super-Hi™ Lamps for store, street, and factory lighting. Contact your authorized Westinghouse lamp agent or nearest Westinghouse sales office.

YOU CAN BE SURE... IF IT'S Westinghouse

WESTINGHOUSE LAMP DIVISION, Westinghouse Electric Corporation, Bloomfield, N. J.

TODAY'S BEST BUY

Install Copperweld Type M Guy Strand on your lines. It's a low-cost, money-saving way to rid yourself, once and for all, of the trouble and expense that result when guys weaken or fail because they haven't got what it takes to resist corrosion.

Copperweld Type M Strand resists corrosion. Each wire is permanently protected against rust by a thick copper sheath that is inseparably molten-welded to a high-strength alloy steel core. And because it's molten-welded, the copper will not crack, flake or peel from the steel core.

As a result you pay for only one guy installation. You can put up Type M Guy Strand and forget it because its original strength is permanently maintained. In fact, this non-rusting guy strand will match the long life of modern poles.

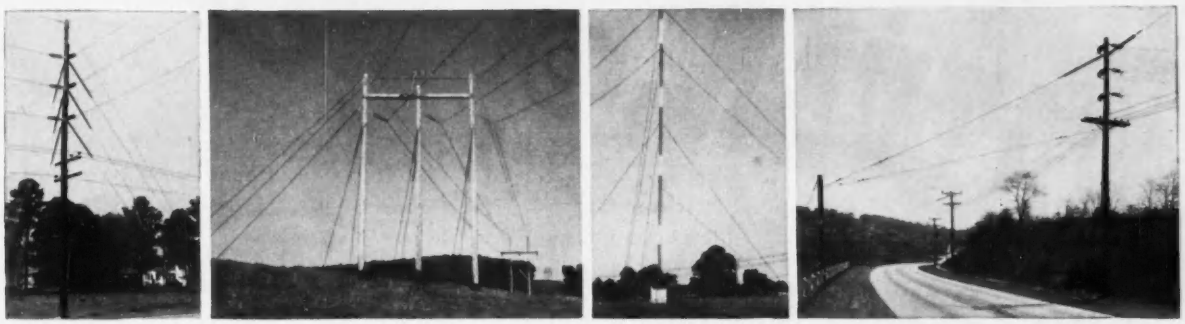
Moreover, Type M Strand goes up fast because it is easy to handle. It can be readily dead-ended by any of the conventional methods. Our Engineering Data Bulletin E.D. 1878 gives you the complete story. Send for it today.

PROVED DEPENDABILITY AND LONG LIFE . .

FOR ALL GUYING PURPOSES . . .

GUY STRAND

requires no maintenance . . . matches pole life



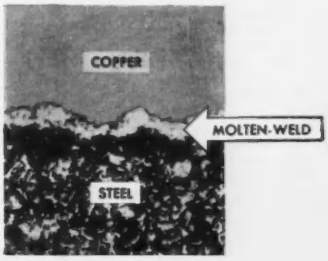
WHATEVER YOU GUY . . . GUY WITH COPPERWELD TYPE M STRAND

Easily installed, Copperweld Type M Strand provides low-cost, safe and permanent guying for overhead lines, towers, poles, antennas, stacks, and similar structures. Put this non-rusting strand up and prove it for yourself.

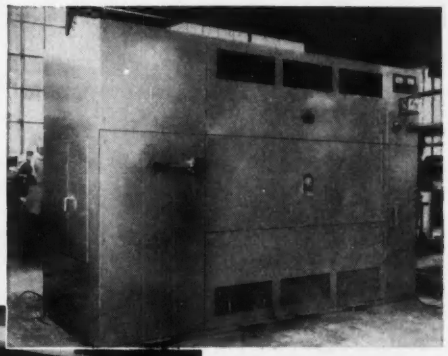
COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

. . . . . *assured by the* **MOLTEN-WELD**
-exclusive with Copperweld

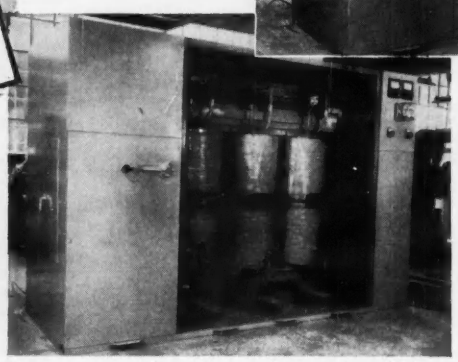
Weld area of Copperweld Wire, greatly enlarged



MARCUS dry type TRANSFORMERS are insulated with NATVAR SPECIAL INSULATION



This trim, compact cabinet houses a Marcus 2000 kva., 4800-480 volt, 3 phase, 60 cycle, dry-type transformer which will supply intermediate AC power to a bank of selenium rectifiers in a large West Coast metal reduction plant.



This interior view shows the rugged construction of Marcus industrial unit substations. A Natvar special combination of Quinorgo® firmly bonded to varnished open-weave Fiberglas provides a flexible insulation of high dielectric strength and great mechanical toughness, plus the ability to withstand continuously high operating temperatures. It is used as a layer insulation for the major insulation barrier between primary and secondary, and between core and coils.

Marcus Transformer Co., Inc., Hillside, N. J. manufactures dry-type transformers from 1 to 3000 kva. capacity, engineered for long life and continuous, trouble-free service.

All materials used in their construction are carefully chosen for durability and performance under maximum loads at high temperatures. A Natvar special combination of Quinorgo® and Fiberglas firmly bonded together is used because of its exceptionally good electrical properties, flexibility, mechanical strength, and its ability to withstand heat.

Whether your requirements call for a standard insulating material, available either from your wholesaler's stock or direct from our own, or a special combination, it will pay you to investigate Natvar flexible insulations.

Natvar

Natvar Products

- Varnished cambric—sheet and tape
- Varnished canvas and duck—sheet and tape
- Varnished silk and special rayon—sheet and tape
- Varnished papers—rope and kraft—sheet and tape
- Varnished, silicone varnished and silicone rubber coated Fiberglas*—sheet and tape
- Slot cell combinations, Aboglas®
- Isoglas® sheet and tape
- Isolastane® sheet, tape, tubing and sleeving
- Vinyl coated and silicone rubber coated Fiberglas tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

*T.M. (Reg. U.S. Pat. Off.) OCF Corp.

We will be very happy to supply information on any of our products on request.

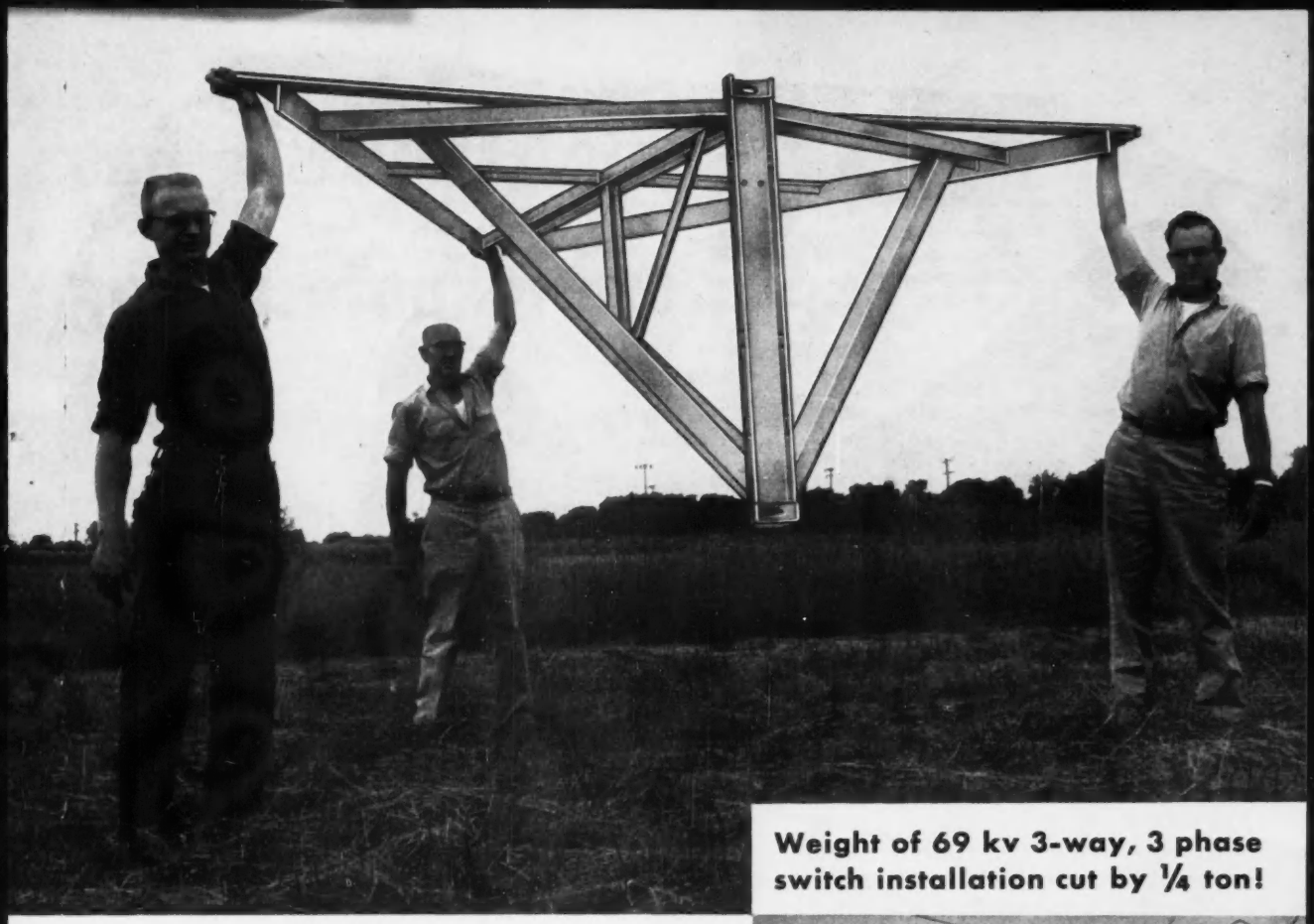
NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE FULTON 8-8800

CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY



Weight of 69 kv 3-way, 3 phase switch installation cut by ¼ ton!

ALUMINUM FRAMES

make CHANCE GOABS

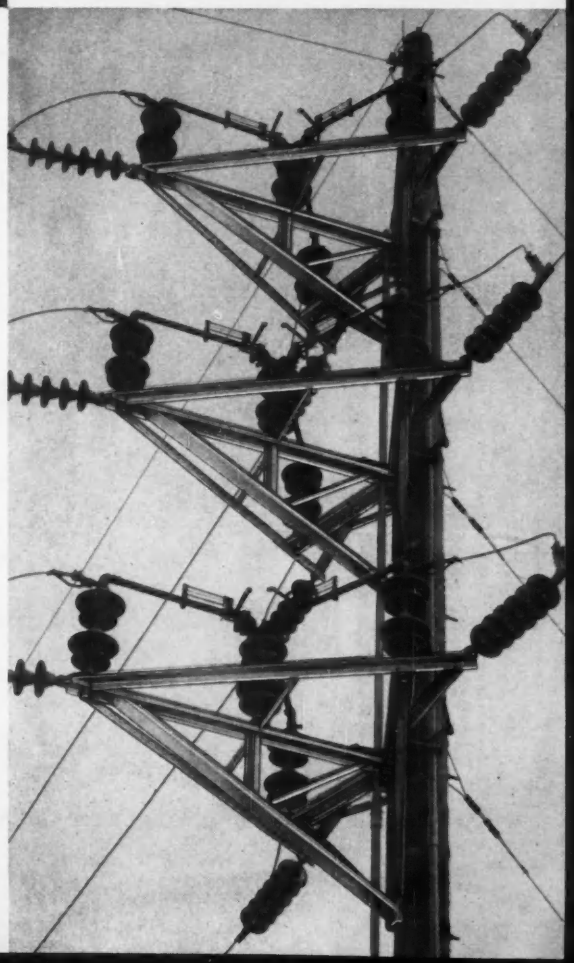
easier to install — lighter on poles

Now, Chance GOABS give you the added advantages of welded structural aluminum frames as standard equipment. The frames have been designed and field-tested to hold the same loads as steel frames—with greater platform stability to assure good switch operation—and with excellent corrosion resistance for longer life.

Frame weights have been reduced from 40% to 66%. The popular 69 kv 3-way frame shown above weighs only 164 pounds (52% less than its steel counterpart). Less weight makes GOABS much easier to transport, to handle and to mount . . . puts less strain on the pole.

You're dollars ahead from the start when you use Chance Group Operated Air Break Switches for tap switching. Vertical phase-above-phase mounting, requiring only a single pole for 1, 2 or 3 way switching, means lower initial costs, lower maintenance costs, and minimum right of way requirements.

You get the finest in advanced engineering design with the Chance line of switching equipment.

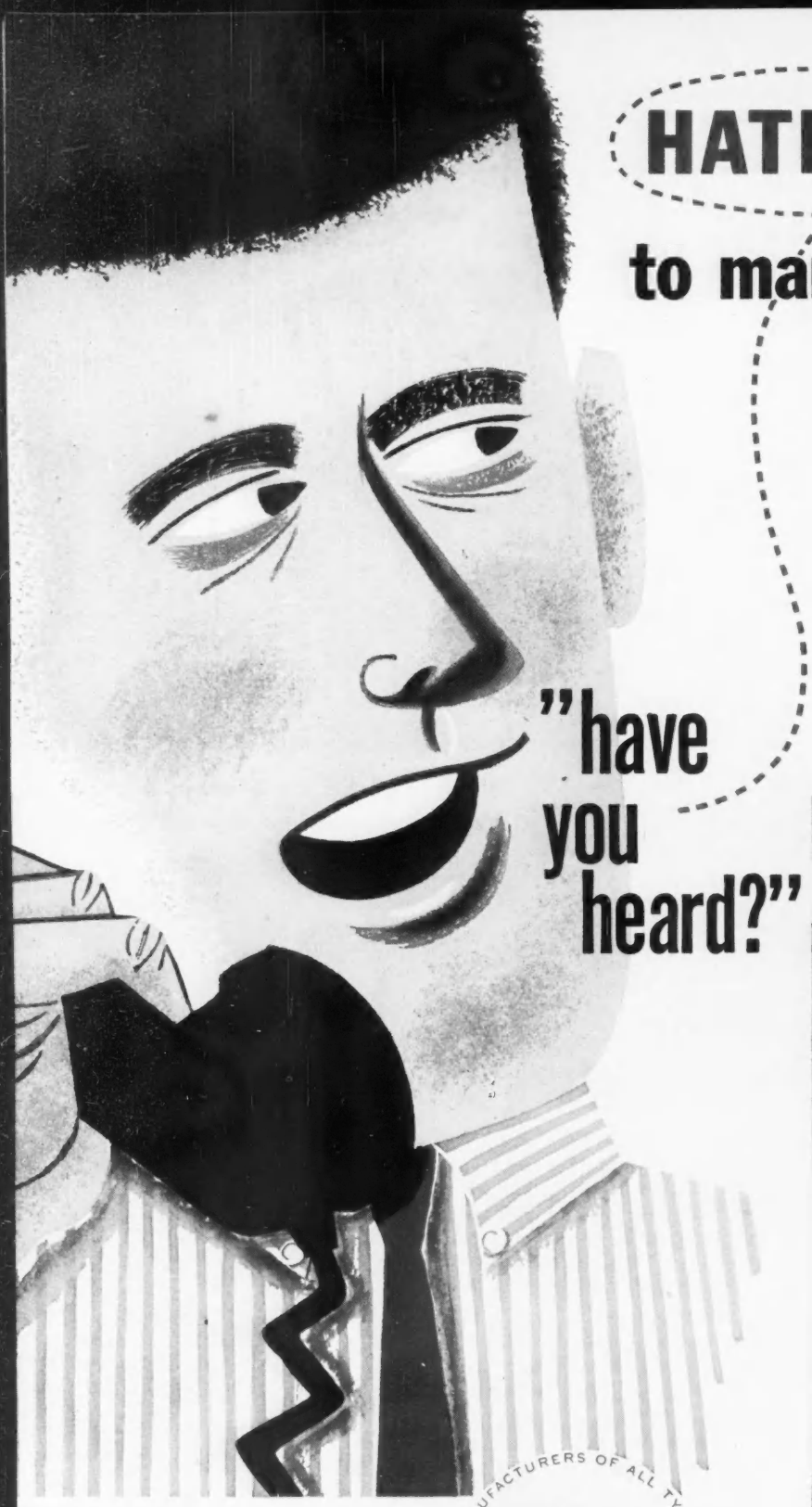


ABC INDUSTRIES

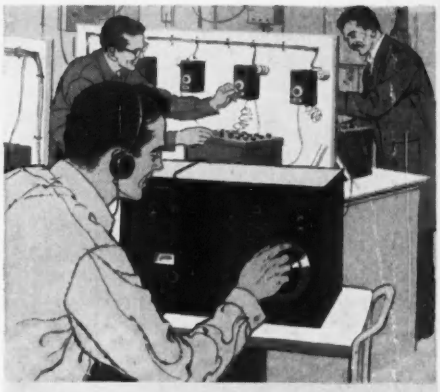
A. B. CHANCE CO CENTRALIA MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto CS59-20

HATFIELD has to manufacturing



"have you heard?"



EXPANDED TEST AND DEVELOPMENT FACILITIES

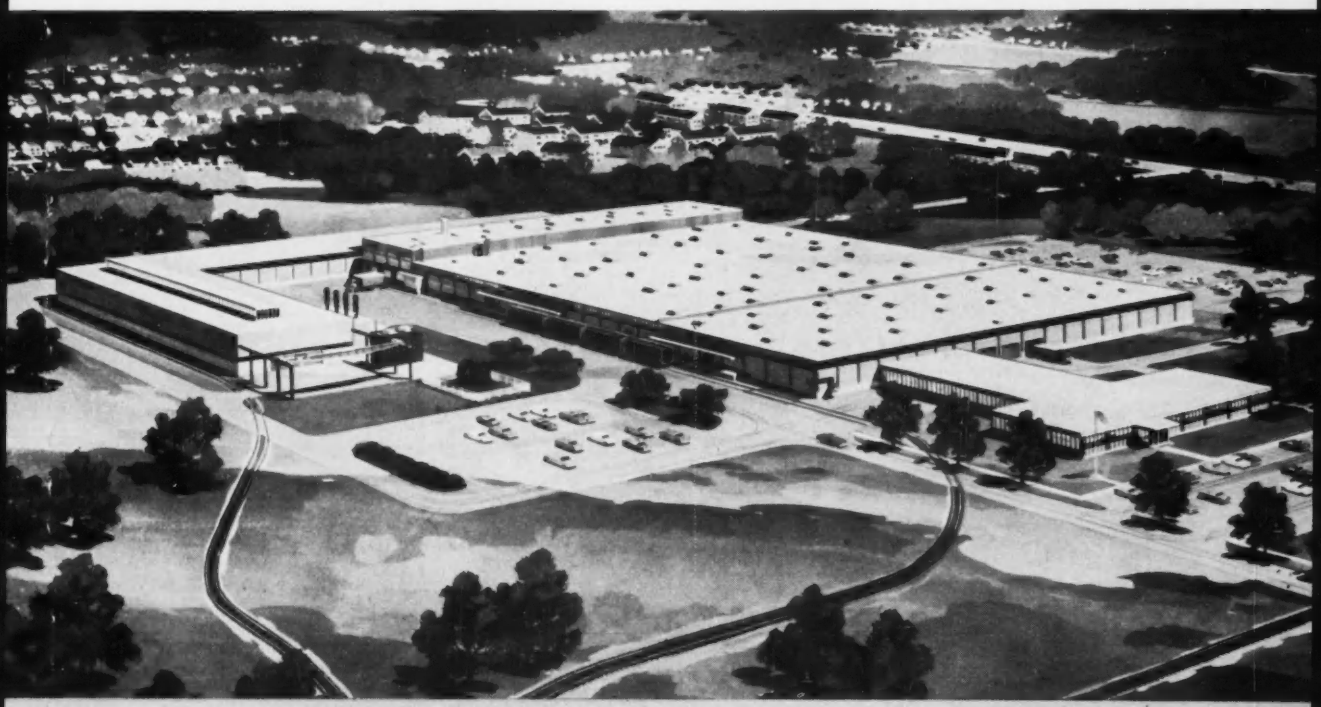
at the new Linden plant are among the most outstanding in the high voltage cable field. In addition to the usually required quality-control test procedures for every foot of cable produced, there are also special tests. For example, we have installed a group of specially designed corona level instruments and test cables — right on the production line. Another "extra" from Hatfield to assure complete customer satisfaction.

MANUFACTURERS OF ALL TYPES OF INSULATED WIRE & CABLE

HATFIELD WIRE & CABLE

the largest new plant devoted exclusively of rubber covered wire and cable

Here's solid proof of Hatfield's confidence in the future of the electrical industry! An entirely new plant, ready to take your orders for rubber insulated high voltage and the larger multi-conductor power cables. We're geared to produce "specials" or to ship standard items from warehouse stock as complete as you'll find anywhere. This new Linden, N. J. plant augments completely separate facilities in Hillside and Union, N. J. where most other types of wire and cable products are manufactured. It all adds up to this—whether your wire and cable needs are for building construction, light or heavy industry, governmental agencies or utilities—now you will find Hatfield to be one of the best equipped producers of the highest quality products.

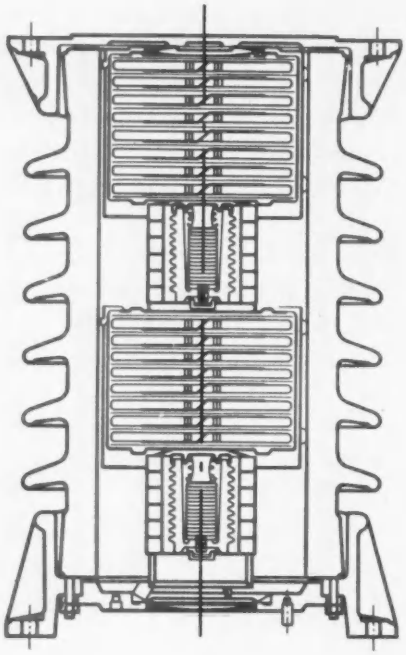


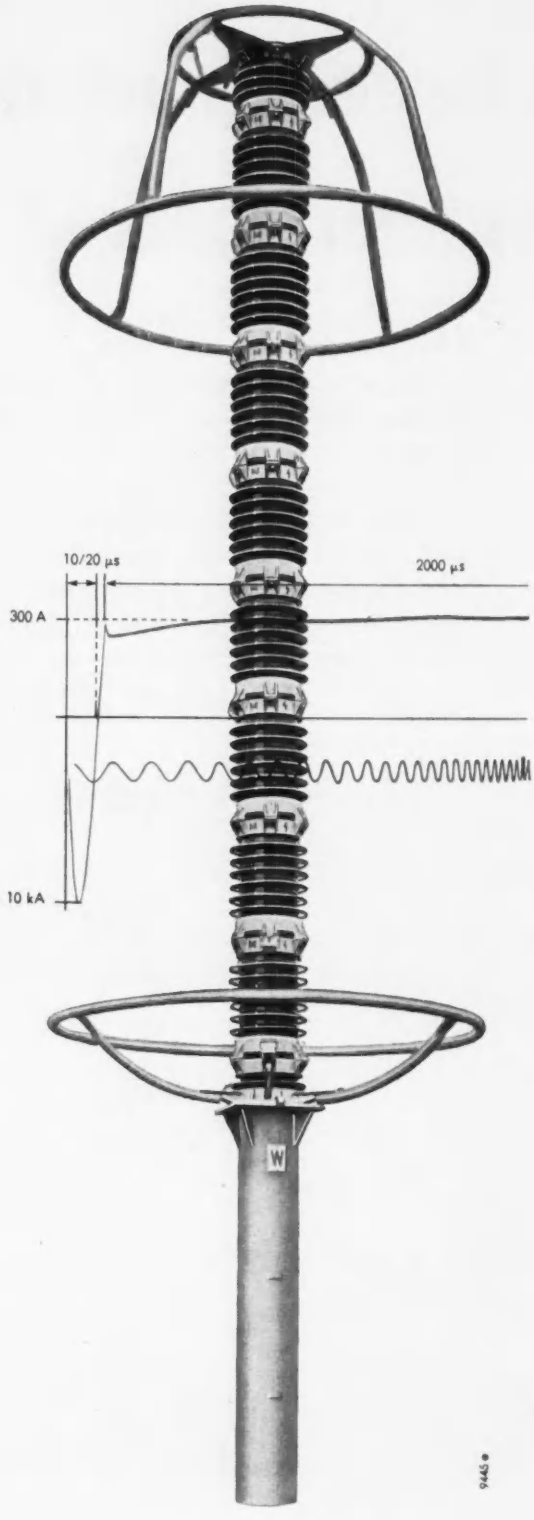
This new plant for the production of rubber insulated wire and cable, together with the copper rod mill now under construction, will be part of the HATFIELD Linden complex. It is geared to give HATFIELD the most up-to-date, integrated facilities in the wire and cable field.

DIVISION OF CONTINENTAL COPPER & STEEL INDUSTRIES INC. / PLANTS · HILLSIDE · UNION · LINDEN / EXECUTIVE OFFICES · HILLSIDE, NEW JERSEY

CCA Continental

AEG





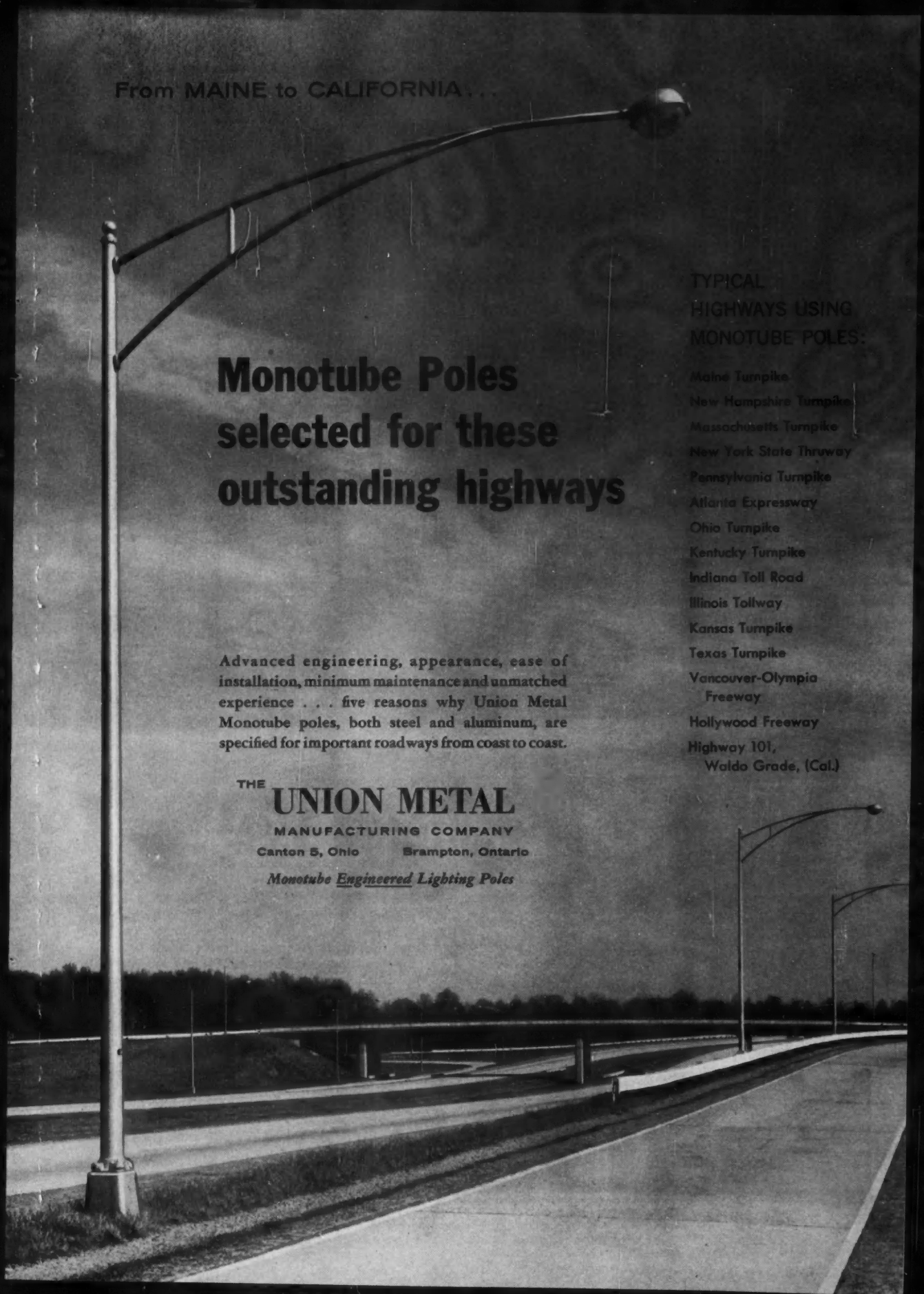
Lightning arresters

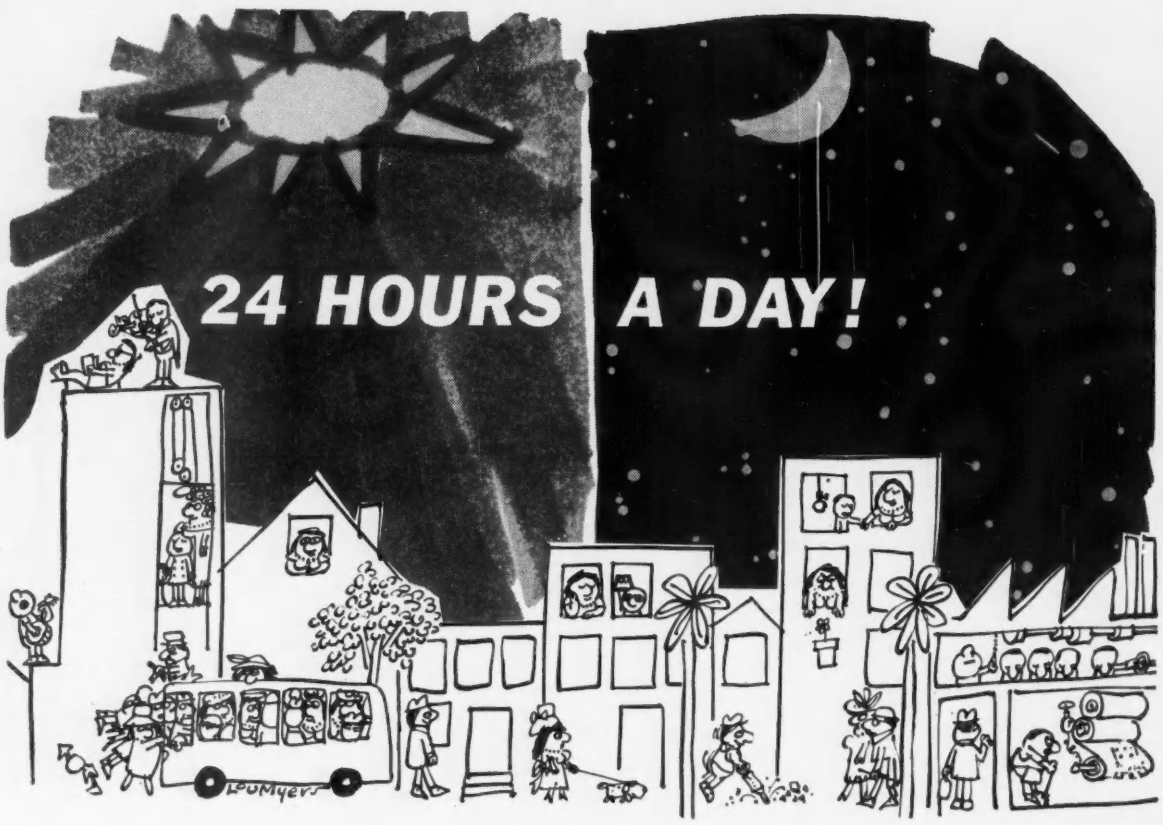
of self-supporting design
for highest voltages

Type SAWFV

Voltage rating 340 $kV_{r.m.s.}$
50% Breakdown voltage 730 - 860 $kV_{(max)}$
(1/50 µs wave)
Residual voltage $<$ 1155 $kV_{(max)}$
(discharge current 10 kA)

ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT
Berlin (West) EXPORT DEPARTMENT Frankfurt (Main)


From MAINE to CALIFORNIA . . .
Monotube Poles selected for these outstanding highways
TYPICAL HIGHWAYS USING MONOTUBE POLES:
Maine Turnpike
New Hampshire Turnpike
Massachusetts Turnpike
New York State Thruway
Pennsylvania Turnpike
Atlanta Expressway
Ohio Turnpike
Kentucky Turnpike
Indiana Toll Road
Illinois Tollway
Kansas Turnpike
Texas Turnpike
Vancouver-Olympia Freeway
Hollywood Freeway
Highway 101, Waldo Grade, (Cal.)
Advanced engineering, appearance, ease of installation, minimum maintenance and unmatched experience . . . five reasons why Union Metal Monotube poles, both steel and aluminum, are specified for important roadways from coast to coast.
THE UNION METAL MANUFACTURING COMPANY
Canton 5, Ohio Brampton, Ontario
Monotube Engineered Lighting Poles



ROEBLING GAS-FILLED CABLE! looks out for your best interests!

Impregnated paper/insulation, with shielding.
Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.
THE SHEATH ON THIS CABLE . . . is one more reason why it's a best buy! The Tellurium-Lead Alloy Sheath offers the best possible resistance to fatigue and age-hardening problems . . . has 90% less creep, 4½ times greater bending life!
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Non-magnetic shielding tape over cable core.

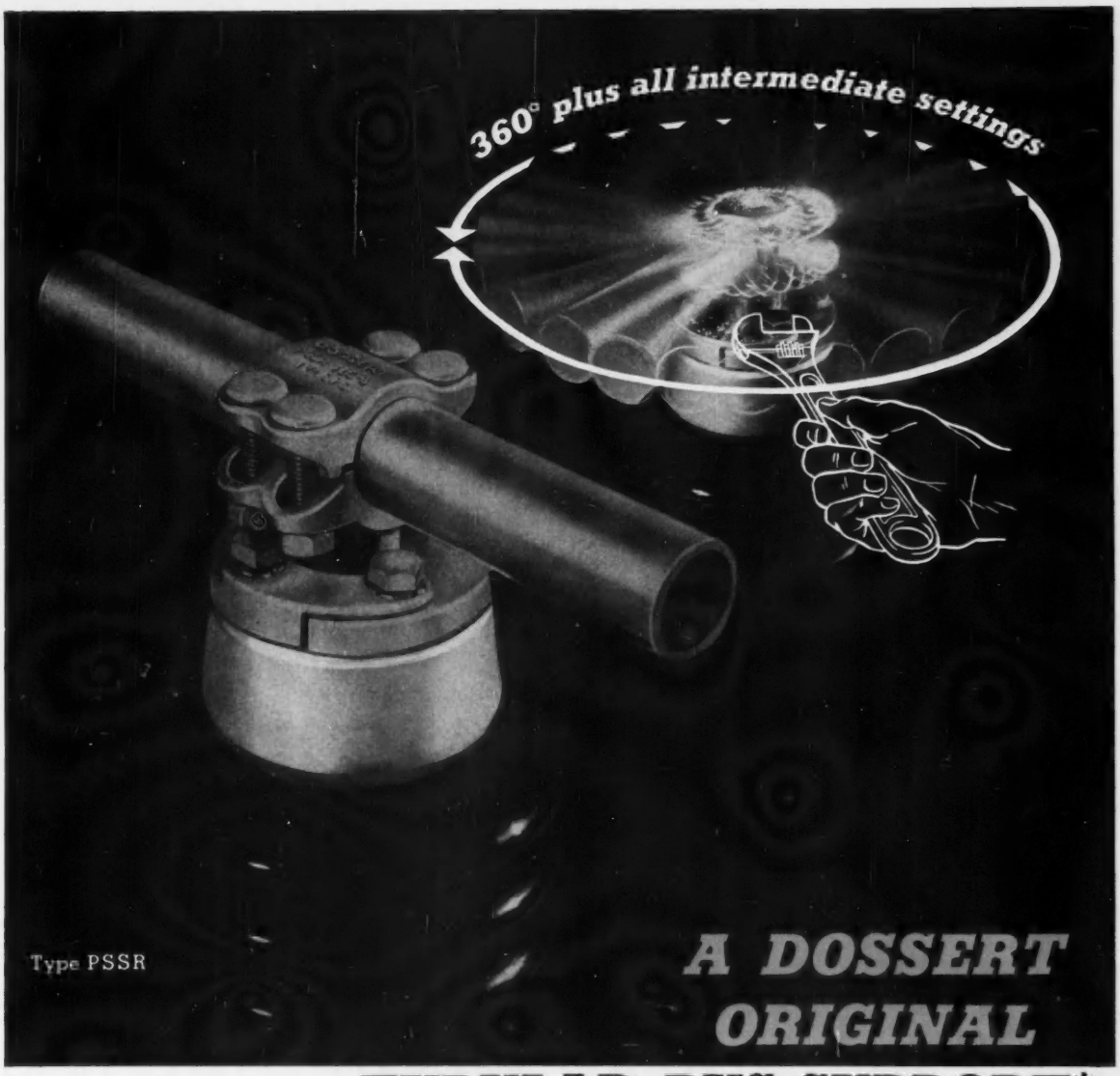
Roebling Gas-Filled Cable (for voltages up to 46 kv) is *self-supervisory!* Super-dry nitrogen gas, inside this cable at approximately 12 p.s.i. pressure, is the key. When gas pressure drops below 10 p.s.i. or rises above 16 p.s.i.—an automatic signal message is relayed to the nearest attended station. You know when trouble's afoot the second it starts! Repairs can be made *before* serious damage occurs!

Along with this extra *protection*, this cable has properties that lessen the possibility of outages! The inert dry nitrogen gas provides consistent dielectric properties throughout the length of the cable. It prevents ionization, too, and the other problems often associated with solid-type oil-impregnated cable. What's more, it's as easy to splice as solid-type! And if your system includes grades, it may prove to be the most inexpensive cable you've ever used!

Our new Gas-Filled Cable book tells more about this superbly-made cable. It's free—write for it. Roebling's Electrical Wire Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division, The Colorado Fuel and Iron Corporation



fully adjustable, TUBULAR BUS SUPPORT*

This bus support, made of high-strength bronze throughout, has the following outstanding features:

- Fully adjustable to any angle whatsoever within a complete circle (360°).
- No need to lift bus out of support to change angular position.
- To change position within seconds, merely loosen 4 insulator mounting bolts, rotate assembly to desired angle and re-tighten bolts.
- No inaccessible internal bolt employed for angular setting.
- The only bus support whose angular adjustment does not jeopardize its overall strength.
- By reversing cap bus can be tight-mounted or slip-mounted.

Write for illustrated brochure!

***U. S. PAT. 2,861,762**

50 YEARS OF TECHNICAL LEADERSHIP

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn, New York

Representatives in principal cities.

Distributed outside the U.S.A. and Canada by

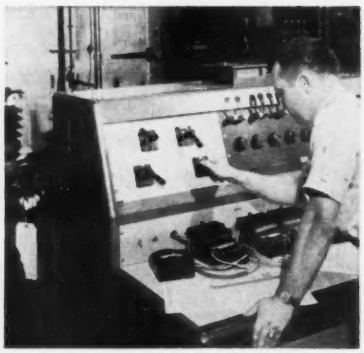
INTERNATIONAL GENERAL ELECTRIC COMPANY

Construction Materials and Lighting Sales

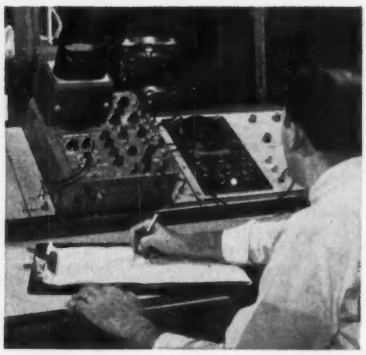
150 East 42nd Street, New York 17, N.Y. U.S.A.

More DELTA-STAR TRANSFORMERS

RATIO AND POLARITY



EXCITATION-LOSS AND IMPEDANCE



IMPULSE

Tests like these—and many more—are performed at the Delta-Star factory on each transformer, to assure new-customer approval. We welcome your tests as an opportunity to demonstrate Delta-Star performance.

for Long Island Lighting Company

Long Island Lighting Company, N.Y., is another of the major utilities that has recently tested and approved *palletized* Delta-Star Distribution Transformers, for use on their lines.

In the hotly competitive transformer market, it takes equipment with really good features to catch on as Delta-Star has done. Mere claims of quality are not enough. The transformers must measure up —and, obviously, Delta-Star Transformers are satisfying customer demands wherever they're tried.

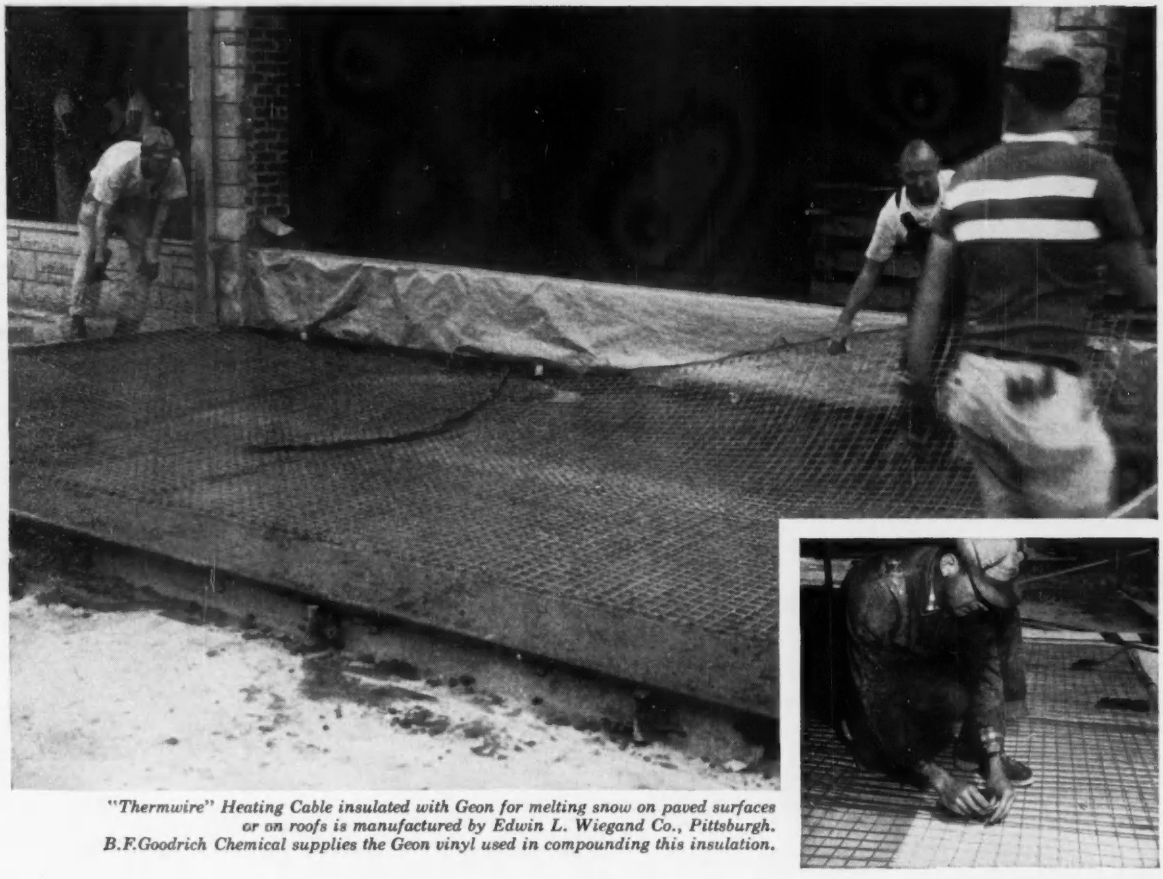
It will pay you to consider the complete line of Delta-Star EEI-NEMA Distribution Transformers in your modernization plans. For complete information, see your local Delta-Star representative or write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois.*

DELTA-STAR ELECTRIC DIVISION PORTER **H. K. PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

Another new development using

B.F.Goodrich Chemical *raw materials*



"Thermwire" Heating Cable insulated with Geon for melting snow on paved surfaces or on roofs is manufactured by Edwin L. Wiegand Co., Pittsburgh. B.F.Goodrich Chemical supplies the Geon vinyl used in compounding this insulation.

Bury Geon-insulated cable by taping to reinforcing wire in concrete

Snow shoveling won't be a problem for these shopping center sidewalks. Heating cable insulated with Geon vinyl is buried in the concrete. 190-foot lengths of cable are taped to the reinforcing wire rolled out between pourings. After the top ¾" layer of concrete is poured, the installation will be a permanent, load-building work saver.

Insulation made from Geon is especially useful for a buried-in-concrete installation because of its unusual resistance to abrasion, aging and most causes of corrosion. Other materials that were tried got brittle with heat—not Geon: it retains its excellent dielectric properties and flexibility.

Here's another way new applications are being developed through use of Geon vinyl. For more information, write Dept. GX-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

A TRADE MARK OF B.F.GOODRICH CHEMICAL COMPANY
Geon
VINYLS
A DIVISION OF THE B.F.GOODRICH COMPANY

B.F.Goodrich Chemical Company
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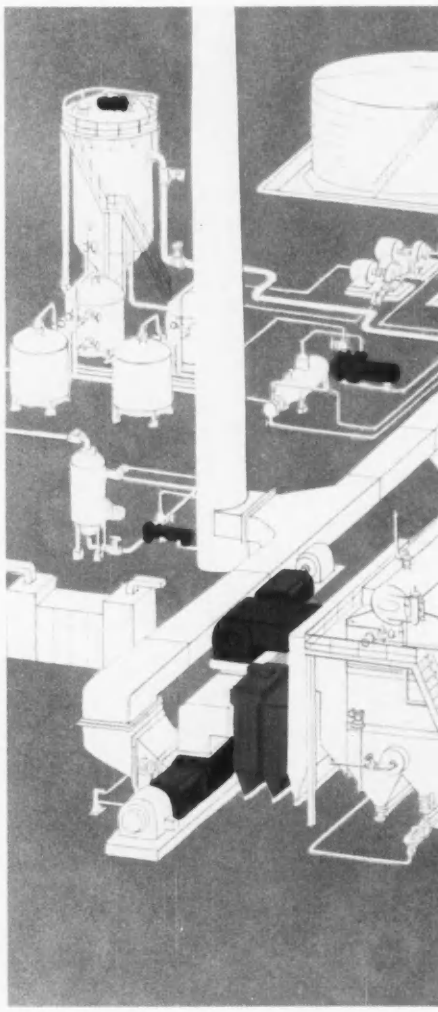
B.F.Goodrich — GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

American-Standard Industrial Division POWER-LIFT IN AC

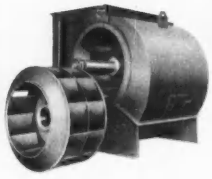
1959

Early in 1959 three American-Standard divisions—American Blower, Ross Heat Exchanger, and Kewanee Boiler—were combined into a single organization under a new name: American-Standard Industrial Division. The year 1959 was spent fruitfully—consolidating product lines, accelerating new product development, gearing up to meet the stepped-up requirements of the fast-paced, highly specialized power industry.



1960

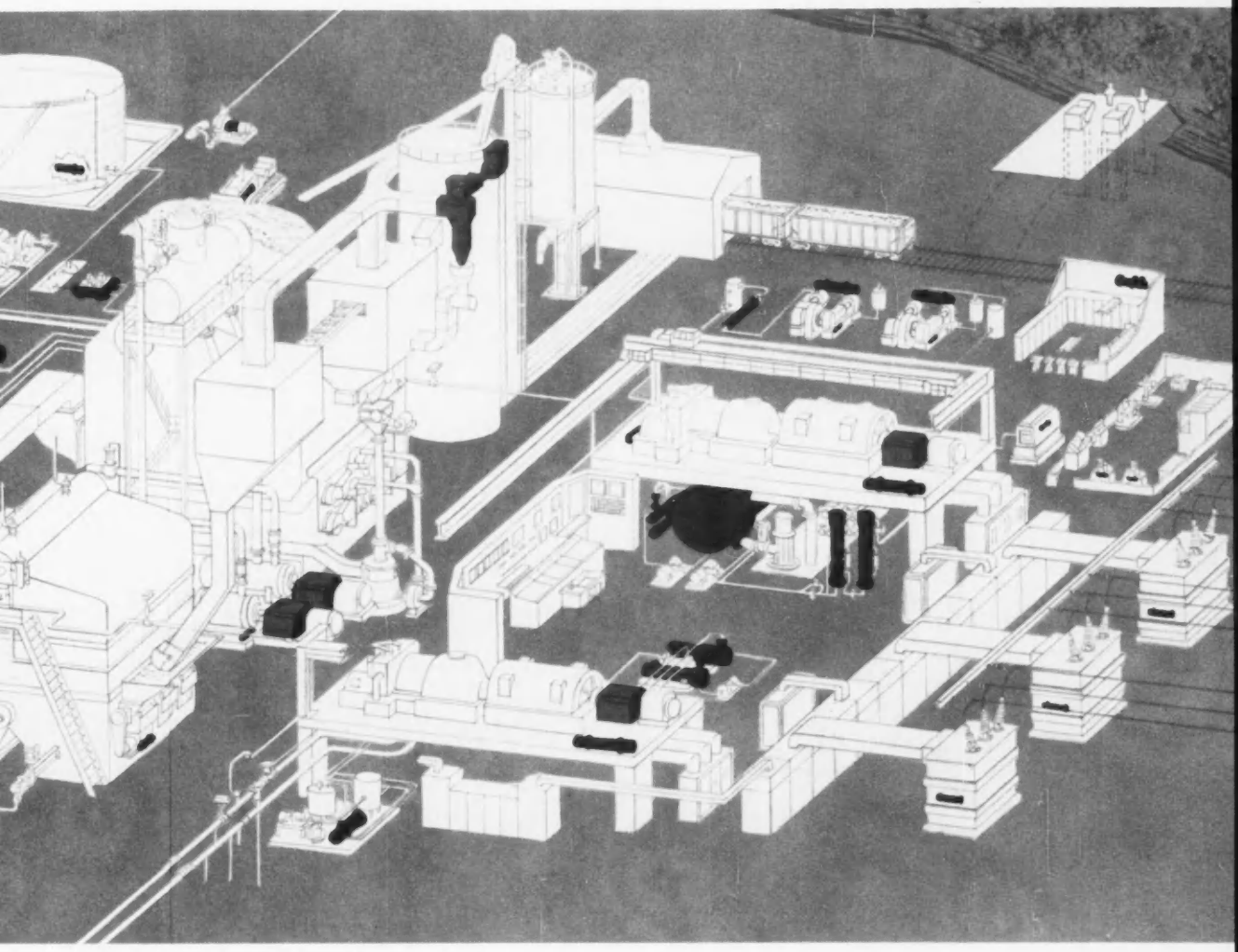
Today, we're confident that you'll find new benefits in specifying products from American-Standard Industrial Division . . . products that now encompass the major fields of heat transfer, mechanical draft, boiler feed pump and fan control, fly ash and dust control, heating, ventilating, and air conditioning. The illustration at right shows where many of these products may be applied in a modern steam plant. Each is designed, engineered, and manufactured to help you produce power efficiently and economically. Each is backed by an honestly won reputation for reliability on the job.



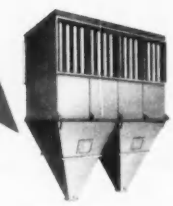
Mechanical Draft Fans

COPYRIGHT 1959, AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

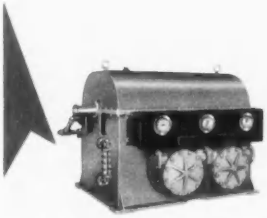
ACTION



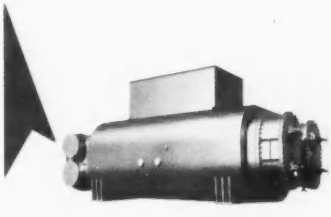
Here's where some of American-Standard Industrial Division products serve in a modern power plant.



Dust and Fly Ash Collectors

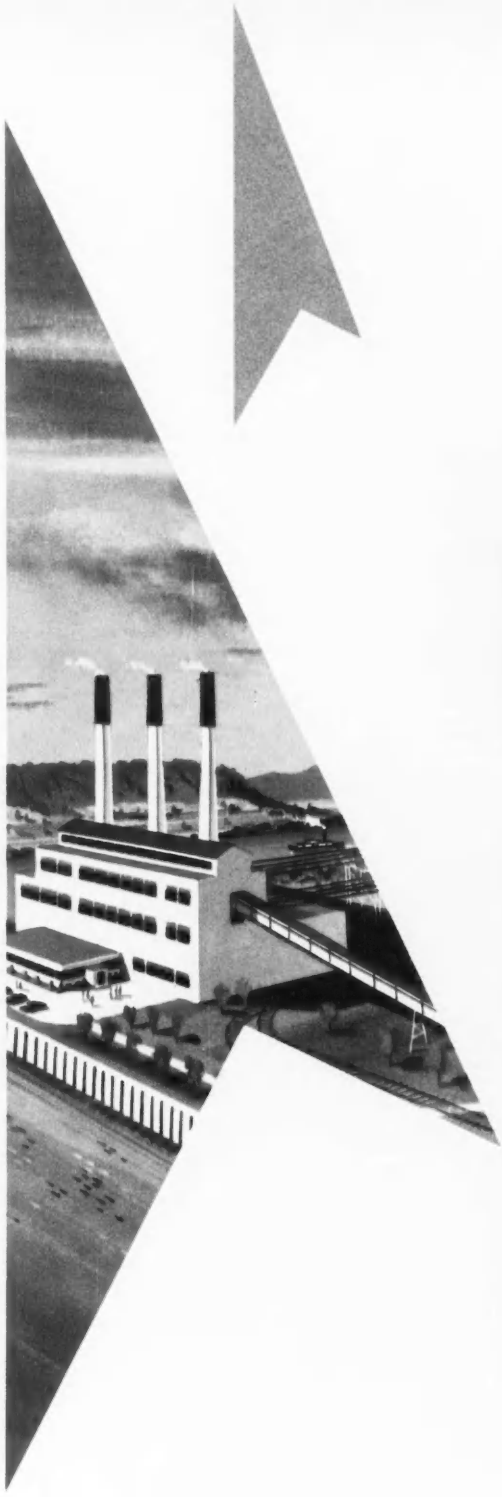


Gyrol® Fluid Drives for fan and feed pump control



Surface Condensers and Feedwater Heaters

Heat Exchangers and After Coolers



New from American-Standard
Industrial Division

Power-Lift† for Power Plants

Power-Lift is a timely new concept of coordinated products and services from American-Standard Industrial Division. Its purpose is to help you raise overall efficiency in your plant by offering *products* that are proved in the field and designed, engineered, and manufactured to a uniform standard of quality and performance . . . with *service* by product specialists in every principal city.

To see how Power-Lift services can benefit you . . .

← LIFT THE FLAP

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American-Standard Industrial Division
Power-Lift Products and Services

Talk over your requirements with an American-Standard* Industrial Division product specialist. You'll find him well prepared and experienced—frequently able to base equipment recommendations upon precedents of proved success. And, in many instances, our comprehensive standardization paves the way to savings in time and cost. Offices in all principal cities. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO. EXPORT DIVISION, AMERICAN-STANDARD, NEW YORK CITY.

SURFACE CONDENSERS

Designed to service the largest of today's and tomorrow's steam turbines. Low bundle entrance velocity; liberal steam transportation lanes; moisture impingement grids to extend tube life; expansion diaphragms; effective de-aeration and many other features created during 40 years of surface condenser development and research.

MECHANICAL DRAFT FANS

Complete range of sizes and types for forced draft, induced draft, gas recirculating, and primary air fan applications. Designed to meet rigid requirements of modern power plants where maximum pounds of steam are produced daily at peak efficiency. Airfoil, forward curved, backwardly inclined, radial, radial tip blades.

FEEDWATER HEATERS

Design incorporates unique new High Pressure closure. Maintenance is simplified with only four major parts. Exceptionally high safety factor built into all units—more than double ASME Code requirements. Temperature stresses from start-ups or load changes virtually non-existent.

HEAT EXCHANGERS

Designed and built with thoroughness and precision. Standard or specially engineered units for virtually all conditions and applications, including high pressure-high temperature exchangers, compressor inter- and after-coolers, fuel oil heaters, blow-down exchangers, and many others.

GYROL® FLUID DRIVE

Provides stepless adjustable speed control for fans and boiler feed pumps. Performance, power savings, and reliability proved in the field. Units for motor driven boiler feed pumps or for "on-the-shaft" duty on main turbine generator. Drives are available for fan and pump duties for all boiler sizes.

DUST AND FLY ASH COLLECTORS

Type "D" Dust Collector: mechanical "cyclone-type" collector. Series 342 Dust Collector: uses "cyclone" principle, with individual tubes which permit flexibility in design to fit plant layout. Series 361 Dust Collector: combines primary and secondary systems for high efficiency fly ash recovery.

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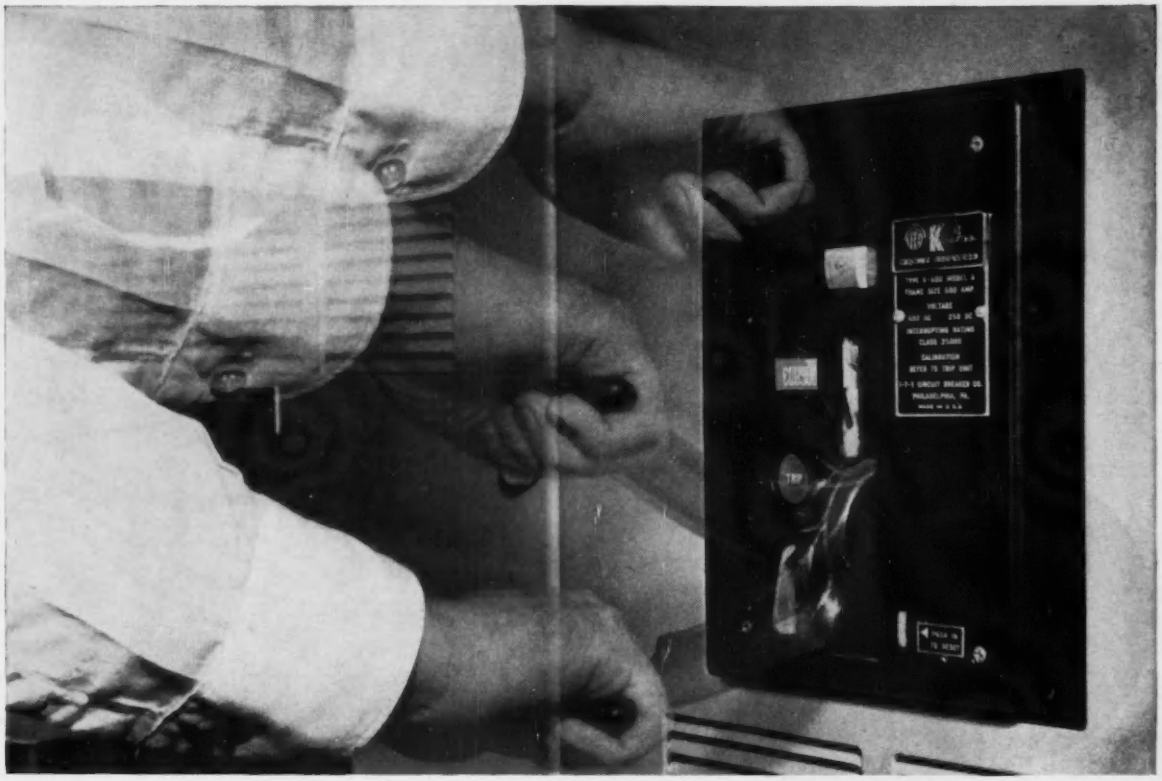
AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS



I-T-E started a revolution in 1957 when it introduced the completely new K-Line circuit breaker with stored energy closing. Today it is still the most advanced circuit breaker for low voltage switchgear you can buy.

ONLY I-T-E 600 V. SWITCHGEAR GOES BEYOND STORED ENERGY

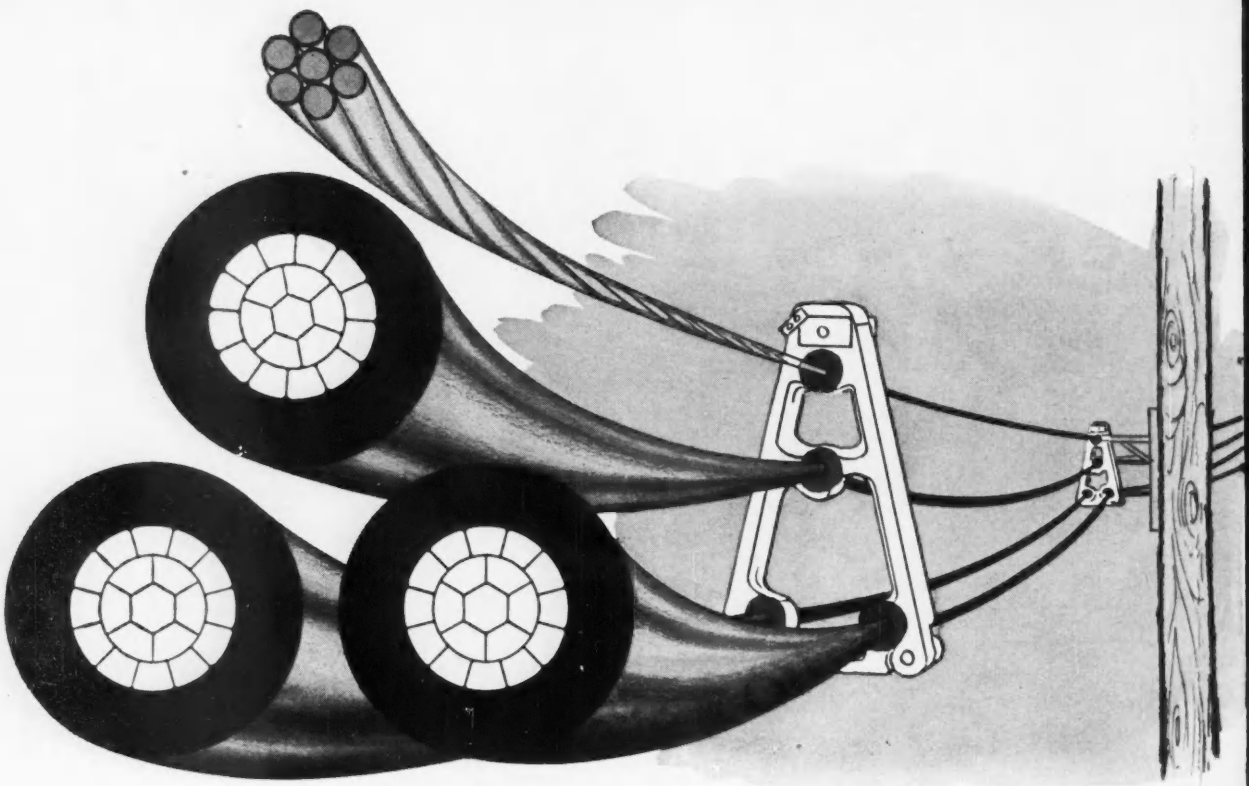
GIVES YOU ADVANCES NO OTHER GEAR OFFERS

Closed door disconnect. A real safety feature. Operator can rack breaker out to either test or disconnect position without opening door. Prevents cluttered aisles from open doors and protruding breakers. And keeps breakers clean when they are disconnected.

Expanded range trip. I-T-E breakers can grow with your loads. Each trip device has roughly three to four times the range of conventional devices. Saves cost and downtime that replacement would demand. Easy to adjust. Calibrated directly in amperes.

You pay no more. That's right. With all these extra advances I-T-E low voltage switchgear costs no more. Send for detailed descriptive Bulletin 6004-C. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY



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COMPRESTO aerial cable is the lightest, most compact stranded conductor available today.

OPERATION through storms and ice conditions greatly improved.

MORE economical than fully insulated aerial cables.

PHASE identification is positive and simple.

REACTANCE is less, thus more improved voltage regulation.

EASY to install.

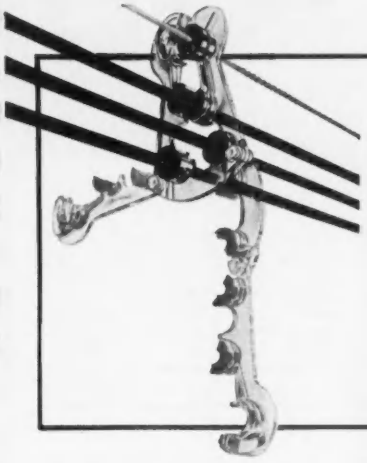
SAME ampere rating as with open wire construction.

TAPS and transformers may be added with little difficulty.

OFFERS improved resistance to compression cutting of the covering.

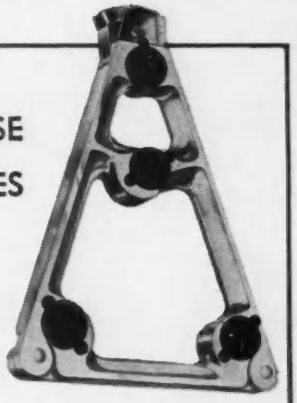
Write for brochure on Aerial Cables

Compresto® NOW AVAILABLE AS SPACED AERIAL CABLES



THE ULTIMATE IN A *COMPACT* SYSTEM CAN NOW BE ACHIEVED BY COMBINING Compresto CABLES WITH **PLM's** NEW "WRAPAROUND" **5KV** SPACERS

FOR **15KV** SPACED AERIAL CABLE SYSTEMS USE **Southern Electrical's Compresto** CABLES AND **PLM's** NEW HIGH **ALUMINA** "WRAPAROUND" "LIFETIME" SPACERS



Southern Electrical Company

OLIN MATHIESON • METALS DIVISION • CHATTANOOGA, TENNESSEE

See Edward R. Murrow on "Small World" every Sunday evening, CBS-TV.

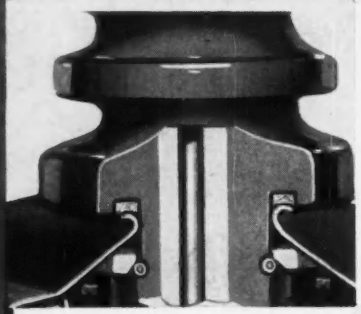
OLIN ALUMINUM

THESE SUPERIOR MOLONEY FEATURES ASSURE DEPENDABLE SERVICE

Moloney Distribution Transformers are available in both conventional and CSP types featuring the Moloney Core and a low impedance coil.

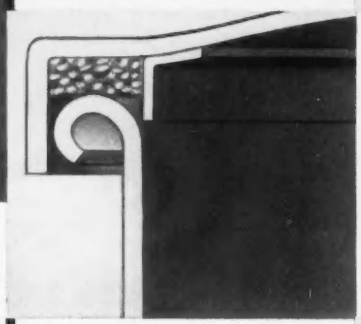
All bushings are made of high strength, wet-process, porcelain and are internally clamped using one piece Almag clamps. The high voltage bushings have a configuration design to obtain liberal creepage without excessive height and to assure high impact strength. Each gasket is made of reusable cork-neoprene and is retained.

Sidewall bushings have the hardware keyed to the porcelain and the porcelain keyed to the tankwall, thereby preventing rotation of the bushing or any of its parts. Sidewall mounted high voltage bushings are equipped with a special cap for clamping the conductor in place quickly and safely without the use of tools.



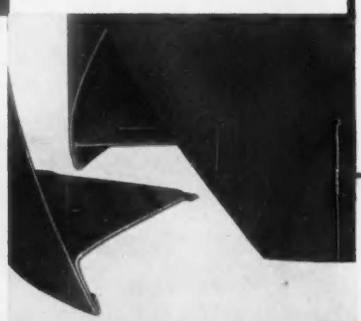
Cover mounted bushings are mounted on a smooth flange raised above the cover. This smooth rounded flange and the shape of the porcelain positively prevents the entrance of moisture. The contour of the flange eliminates corona at this point. Protective caps are provided for all cover mounted high voltage bushings.

Connectors are electro-tin coated and large enough to accommodate either the copper conductors specified by EEI-NEMA Standards or the ACSR equivalent. The large contact surface and a double-coil spring-type washer reduces conductor cold flow.



The tank and cover are die-formed assuring consistently accurate fit. The cover overhangs the tankwall and is dome shaped to shed moisture. The combination of a rolled top rim, cover overhang, cork-neoprene gasket and the gasket retainer positively seals the tank from moisture.

The base is welded to the tank wall. Then a sealing mastic is applied and the tank wall is rolled under the base flange to provide a triple thickness of metal. The tank and cover are painted by a hot-spray process and each coat is baked to form an extremely durable finish.



ME59-6

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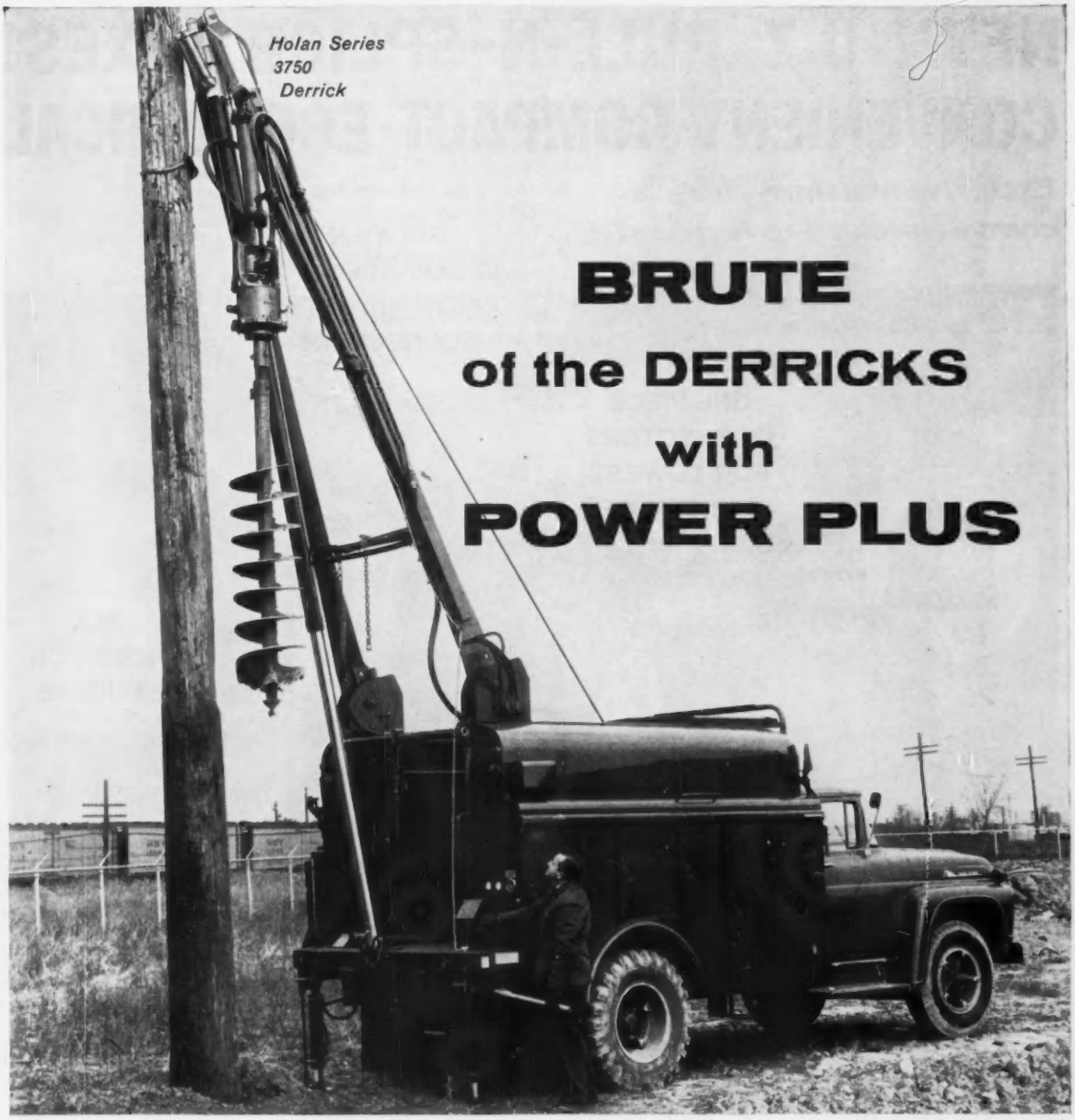


BRUTE of the DERRICKS with POWER PLUS

It's been called "a brute of a derrick" by utility crews all over the country. That's because the new Holan Series 3750 Hydraulic Derrick with live boom is engineered to withstand abuse in the field.

And the 3750 has plenty of muscle. For the record, it has a 12,000-pound capacity, but it has actually been tested at 22,000 pounds.

An integral middle leg with live-boom action provides extra strength for butt-pulling, body loading and other heavy lifting assignments. The rectangular side legs are fabricated of long-lasting, rust-resisting high tensile steel.

Hoisting 5,000 pounds over the rear axle for body loading is a simple task for the 3750. And the 195° operating range makes it possible to lower the derrick to within five feet of the ground for easy threading of the winch line.

There's power to spare in the 3750—power for such tasks as forcing the Holan 5400 Multiple-Speed Digger shown here into hard and rocky soil. And the extra power makes it easy to remove an auger full of dirt.

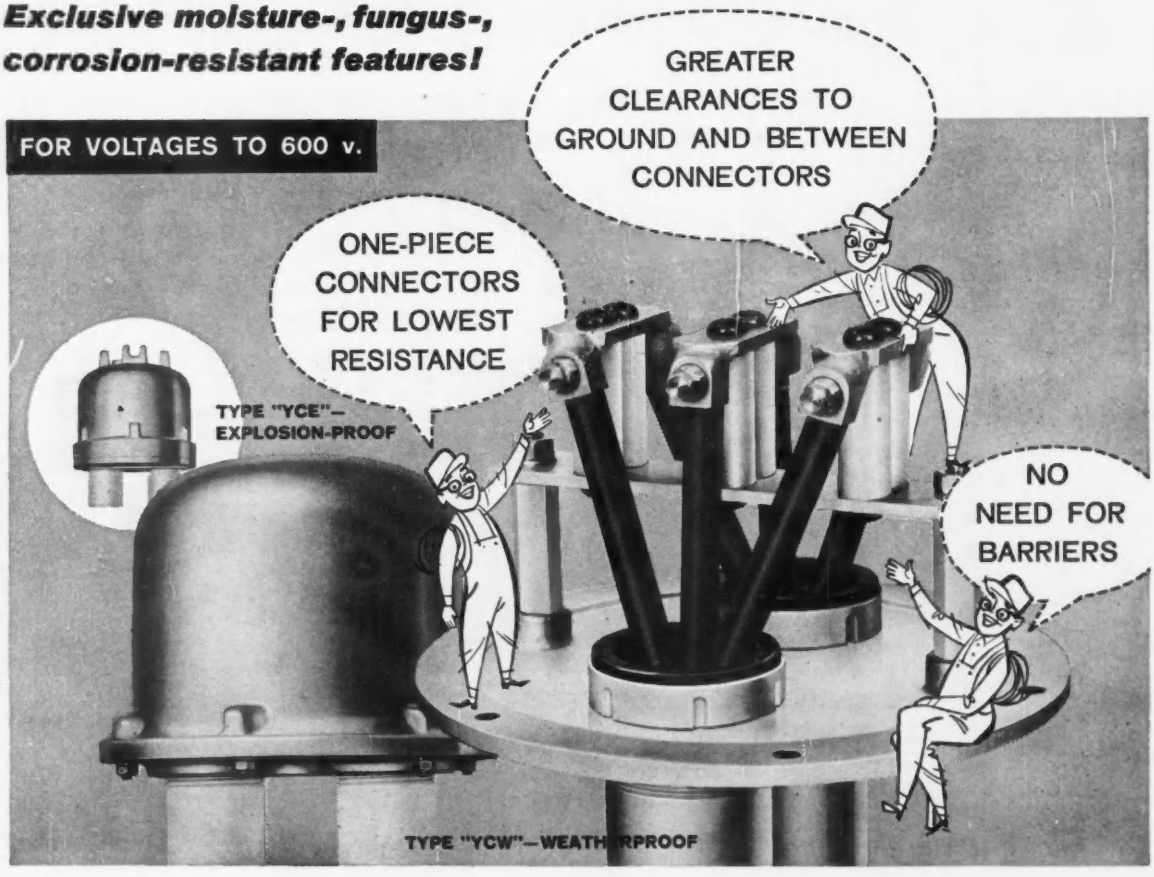
Let us tell you more about this new Holan Derrick. Write us—or call your Holan Field Representative—for complete details.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan
Subsidiary of THE OHIO BRASS COMPANY
HOLAN

NEW! O.Z. PULL-N-SPLICE BOXES!
CONVENIENT · COMPACT · ECONOMICAL

Exclusive moisture-, fungus-, corrosion-resistant features!


FOR VOLTAGES TO 600 v.
GREATER CLEARANCES TO GROUND AND BETWEEN CONNECTORS
ONE-PIECE CONNECTORS FOR LOWEST RESISTANCE
TYPE "YCE"— EXPLOSION-PROOF
NO NEED FOR BARRIERS
TYPE "YCW"—WEATHERPROOF

O.Z. Pull-n-Splice Boxes mark a significant advance in pull box construction!

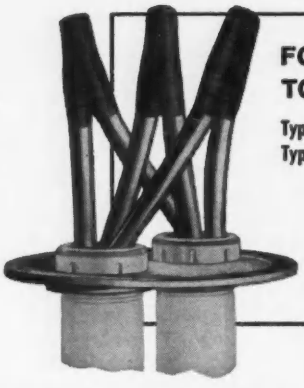
Their highly compact size saves *more space than ever!*

Their more efficient design means *new savings in installation time and labor!*

Their moisture-, fungus-, and corrosion-resistant features mean long, trouble-free service.

Still, with all their features, the new O.Z. Pull-n-Splice Boxes are *smaller* — and *cost far less* than conventional pull boxes . . . even late model *competitive* types! And, you get a bonus in high quality materials and workmanship so characteristic of *all* O.Z. products!

For complete information on these and the many other O.Z. products that mean more for you, call your local O.Z. distributor, or write to the company.



FOR VOLTAGES TO 5000 v.

Type "YPW" — Weatherproof
Type "YPE" — Explosion-proof

Deeper dome than "YCW" and "YCE". Furnished without connector panels. Insulated pigtail splices recommended.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

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- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
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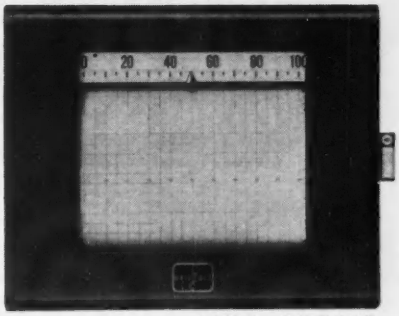
World's first mobile, self-contained nuclear power plant and first U. S. gas-cooled reactor for generating power—these are the dual aims of the Gas-Cooled Reactor Experiment Program (GCRE-I), being carried out at the National Reactor Testing Station, Idaho, for the U. S. Army and U. S. Atomic Energy Commission by Aerojet-General Nucleonics.

We're proud that Aerojet-General, prime contractors for the Army Gas-Cooled Reactor Systems Program and builders of both the reactor and its control system, selected Bristol Dynamaster* potentiometer and bridge instruments to record vital reactor data.

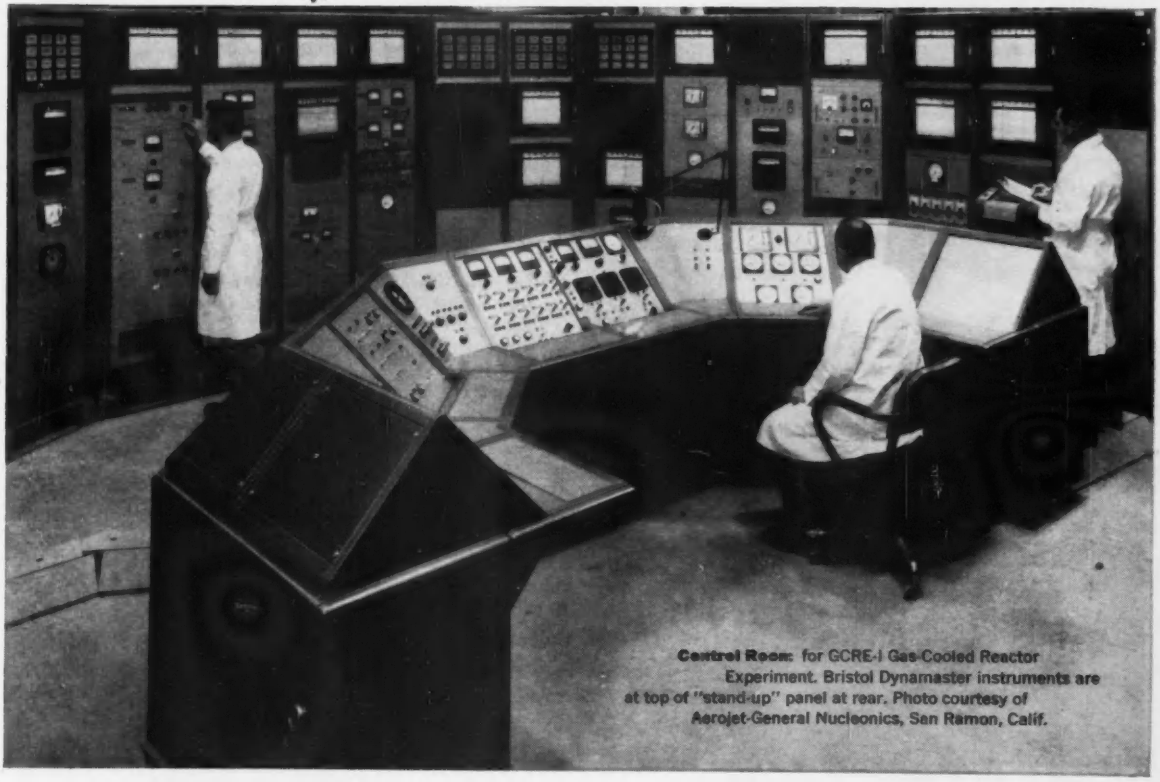
Bristol offers control-systems builders—whether for the nuclear or any other industry—the widest instrument choice on the market for measurement, recording, automatic control, and telemetering. Electronic and pneumatic types. Full-size and miniature (3" strip chart) types. For complete data, write: The Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 9.25

Bristol Dynamaster* Electronic Potentiometer or Bridge Instrument, strip-chart model.



*T. M. Reg. U.S. Pat. Off.

BRISTOL INSTRUMENTS *record Army reactor's progress*



Control Room: for GCRE-I Gas-Cooled Reactor Experiment. Bristol Dynamaster instruments are at top of "stand-up" panel at rear. Photo courtesy of Aerojet-General Nucleonics, San Ramon, Calif.

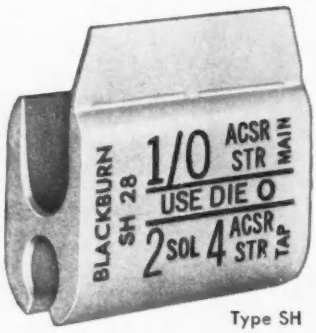
BRISTOL... for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

ENGINEERED INTO
BLACKBURN'S
COMPRESSION CONNECTORS

High Conductivity-

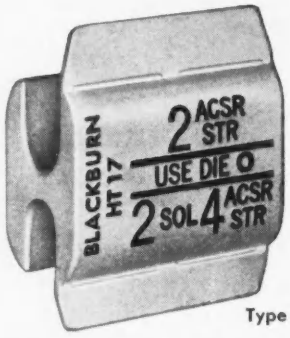
Blackburn has engineered all compression connectors shown to fit your present tooling program—and added advantages to meet engineers' and linemen's requirements.



Type SH

Type HT Prefilled

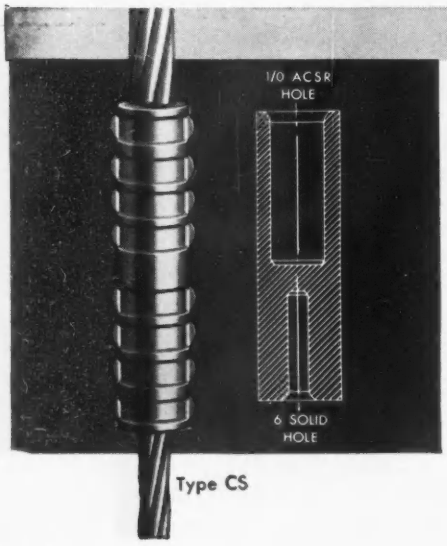
Type SH Prefilled



Type HT

Standardization now possible with Blackburn "H" frame connectors

- **Designed to fit the tools you already have for applying "H" frame type connectors.**
- **Full length tab completely seals out moisture, easiest to bend and install!**
- **Shot blasted to improve conductivity and retard corrosion.**
- **Prefilled with Blackburn's superior oxide-inhibiting compound, Contax, in easy-tear tab vacuum package.**
- **Color fast, large, easy-to-read lettering.**
- **Type HT is reversible, both grooves "open". For large aluminum tap to smaller copper main. Also used for dead ending.**



Type CS

You get higher conductivity with Blackburn service entrance sleeves

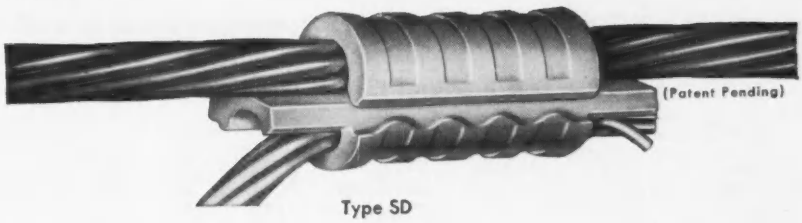
Blackburn—and Blackburn *alone*—provides greater contact area where needed, to assure greater conductivity. This is accomplished by increasing hole depth as the diameter of the conductor is increased, thereby providing more contact area for the conductors being connected.

The Color Coding is *printed* for quick, positive identification.

The sleeves' ends are sealed with Aluminum Sensitized Tape, which is easy to puncture . . . and, if a particle of the seal is pushed into the chamber, the particle is conductive.

Contax, Blackburn's superior oxide-inhibiting compound, is already in these sleeves *in measured amount.* Won't squirt out on glove or in face. And the solid center stop in a Blackburn Sleeve assures proper distribution of the inhibitor around the conductors. Designed for tooling you have.

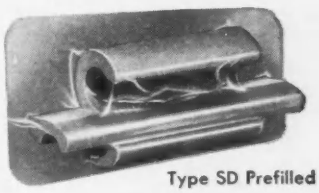
High "Use-Ability"



Type SD

Exclusive drip-guard separator in Blackburn 6-frame tap connector gives *extra* protection to bi-metallic connections

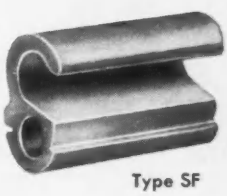
- Spacer allows SD Connector to be used for bi-metal connections with the tools you already have for "C" Frame type connectors.
- An economical substitute for "L" taps, since extended drip guard gives extra insurance against corrosion products bridging the bi-metallic gap.
- A true *two-handed* connector, very adaptable for hot line work.
- Shot blasted for highest conductivity and corrosion resistance.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



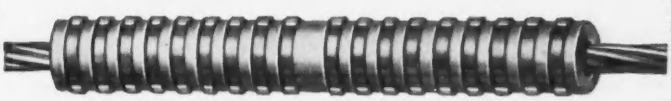
Type SD Prefilled

Type SF

- Recommended for aluminum to aluminum.
- Spacer gives better protection against strand breakage.
- Can be installed with same tooling used for Type SD.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



Type SF



Type TR

Blackburn neutral repair sleeves save dollars on triplex services

- Salvage short lengths of pre-assembled service drop cable with Blackburn Sleeves.
- Designed for and tested with the tools you already have.
- Extra length engineered for neutral pullout values in keeping with dead end devices.

LIVE BETTER ELECTRICALLY

JASPER BLACKBURN CORPORATION

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See JB Catalog 858 for Tooling INFORMATION

HIGHLIGHTS

SIGNIFICANT STATISTICS OF C-E REHEAT BOILERS* ORDERED IN '50s

Total number of units—256. Total capacity—36,555,250 kw. Avg. unit capacity—142,790 kw.

NUMBER OF UNITS

	1450 PSI RANGE(1)		2000 PSI RANGE(2)		2400 PSI RANGE(3)		TOTAL UNITS	
5-year periods	Natural Circulation	Controlled Circulation	Natural Circulation	Controlled Circulation	Natural Circulation	Controlled Circulation	Natural Circulation	Controlled Circulation
1950–1954	49	7	25	34	None	3	74	44
1955–1959	23	None	40	39	None	36	63	75
Total	72	7	65	73	0	39	137	119
GRAND TOTAL	79		138		39		256	

CAPACITY—KILOWATTS**

			AVERAGE PER UNIT		LARGEST UNIT	
5-year periods	Natural Circulation	Controlled Circulation	Natural Circulation	Controlled Circulation	Natural Circulation	Controlled Circulation
1950–1954	7,720,750	6,635,250	104,335	150,800	156,250	260,000
1955–1959	6,649,000	15,550,250	105,540	207,335	200,000	500,000
Total	14,369,750	22,185,500	104,890	186,336		
GRAND TOTAL	36,555,250		142,790			

Comments Note that while average capacity of natural circulation boilers is about the same for both 5-year periods (104,335 and 105,540), the average capacity of controlled circulation boilers (150,800 and 207,335) increased nearly 40% in the second period.

Note, too, that while the total capacity of controlled circulation more than doubled in second period, the total capacity of natural circulation boilers decreased.

Of the total capacity of controlled circulation boilers purchased in second period, over 50% was in the 2400 psi range. Average unit capacity in this range was 217,380 kw.

*Exclusive of eighteen foreign units with an aggregate capacity of 2,000,000 kw. Also excludes six C-E Sulzer Monotube Steam Generators, three for supercritical and three for subcritical pressures, with aggregate capacity of 1,300,000 kw. Five Monotube units in operation.

**Turbine manufacturer's rating

Turbine throttle pressures
(1) 1250-1650 psi. (2) 1800-2100 psi. (3) 2350-2600 psi.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS;

of the Biggest Decade in Power History

Progress in power generation moved forward at a spectacular pace in the fifties. Utility capacity increased from 61,700,000 kw at the end of 1949 to 158,800,000 kw at year end, 1959. Thus, in this one decade, capacity soared to a figure nearly two and a half times that achieved in the seven previous decades of the industry's existence . . . Here are some of the significant highlights of power progress in the fifties.

REHEAT CYCLE TAKES OVER . . . GIVES EFFICIENCY A BIG BOOST

Of the new steam capacity ordered in the past ten years, reheat units accounted for about 85% of the total. While other factors, notably higher pressures and temperatures, contributed to improved efficiency and economy, the widespread adoption of the reheat cycle was primarily responsible for reducing the industry's average heat rate from 15,053 Btu in 1949 to 10,900 (est.) in 1959—a gain of nearly 30% . . . Combustion's first postwar reheat units were ordered in 1947 and installed in 1949—one at the Edgar Station of Boston Edison Company and one at the Port Washington Station of Wisconsin Electric Power Company. The impetus these initial installations gave to the adoption of reheat is revealed in the Table opposite.

CONTROLLED CIRCULATION SPARKS THE TREND TO HIGHER PRESSURES

The first postwar C-E Controlled Circulation Boiler was ordered in 1950 by the Virginia Electric & Power Company and installed in the Chesterfield Station in 1952. The many advantages of this design, especially its suitability for high pressures and large unit capacities, were quickly recognized. The result, as indicated by the figures in the Table, was the most rapid and large-scale acceptance ever accorded a new design of utility boiler . . . The Table also discloses the marked trend toward higher pressures with 36 controlled circulation boilers in the 2400-psi class ordered in the past 5 years as against 3 in the preceding 5 years.

OUTDOOR PLANTS GROWING IN POPULARITY

Of 181 new power stations built in the fifties, slightly over half (92) are of outdoor or semi-outdoor construction . . . Many of these stations are in middle and northern states, including such far northern states as Minnesota, North Dakota and Montana. Thus, the economy and practicability of outdoor construction is finding ever-increasing acceptance. Combustion made the initial boiler installations in over 40% of the new outdoor or semi-outdoor stations placed in service in the past decade.

NEW AVENUES TO FUTURE PROGRESS

Supercritical Pressures—In the history of power progress, the fifties will be credited as the pioneering period in supercritical pressures. Through its installations of two C-E Sulzer Monotube Steam Generators at the Eddystone Station of the Philadelphia Electric Company and one at the Avon Station of The Cleveland Electric Illuminating Company, Combustion is acquiring the technical knowledge and experience to keep pace with the adoption of supercritical pressures as the trend develops. Its Eddystone No. 1 installation marks the present pinnacle of progress in pressures and temperatures with steam conditions of 5000 psi and 1200 F.

Nuclear Power—The fifties will also be recognized as marking the first commercial applications of nuclear power. Shippingport, for which C-E designed and built the reactor vessel, led the parade, achieving criticality in December, 1957, followed by Dresden in October, 1959 . . . Nearly a million kilowatts of commercial power is scheduled to go into operation in the early sixties . . . Combustion's subsidiary, General Nuclear Engineering Corporation, was recently awarded an AEC contract to design a boiling water reactor for the Puerto Rico Water Resources Authority to produce nuclear-generated superheated steam. GNEC made feasibility and preliminary design studies for this project and has made other extensive studies in the field of nuclear superheat. This work has special significance since nuclear superheat gives promise of appreciably reducing capital and fuel costs in atomic power plants.

COMBUSTION C-E ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y. C-256

PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

FERRANTI

250,000 volt Cable Testing Equipment

A 14,000 kVA A.C. High Voltage Cable Testing Equipment which will be the largest ever made in the United Kingdom has been ordered by a large Cable Company, in the U.S.A. It will be used for routine production testing of cable up to 250,000 volts. The value of the order exceeds 250,000 dollars.

Ferranti Ltd. have specialised for many years in the manufacture of A.C. and D.C. Testing Equipments up to 1,000,000 volts and of Impulse Generators up to 4,000,000 volts.

Ferranti

Pioneers of the Electrical Industry with over 75 years' experience in research, development and manufacture

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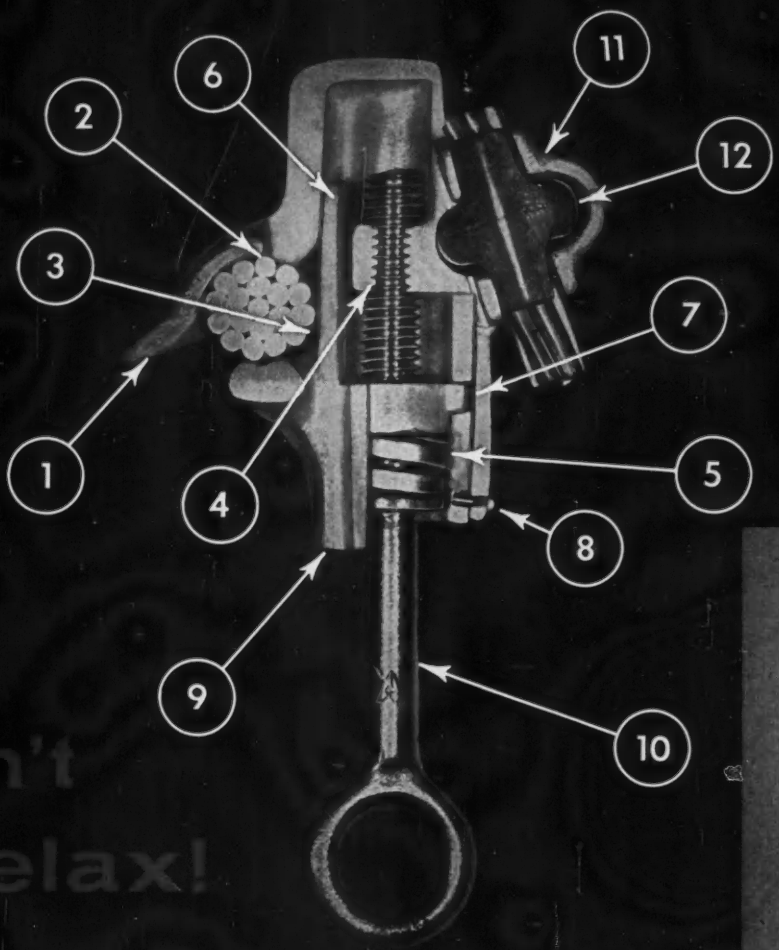


Won't Relax!

AH and BH Series Dura-TAP Hot Line Clamps

PATENT PENDING

Check the 12 features (shown above in cutaway view) of Anderson's new AH (aluminum) and BH (bronze) Dura-TAP hot line clamps. They're 12 sound reasons why you should specify these "won't relax" clamps for your next installation.

1. **Extended "beak" guides clamp onto conductor, minimizes arcing.**
2. **Semi-elliptical groove provides surer contact and wedging.**
3. **Special guide positions conductor in groove.**
4. **Protected threads—prevents freezing of moveable parts and "seizing" of threaded members.**
5. **High compression spring insures full contact at all times.**
6. **Exclusive keeper top rail rides under clamp body, prevents relaxing cantilever action on keeper.**
7. **Keeper guide lug maximizes keeper stabilization.**
8. **Retaining rivet prevents disassembly and interference during installation.**
9. **Extended body rail seats in any standard hot line stickhead.**
10. **Extra strong eyestem—will withstand Mercurous Nitrate test.**
11. **Eyebolt housing is part of main casting for minimum resistance.**
12. **Eyebolt designed to withstand seasonal cracking, stress corrosion.**

AH and BH each available in three sizes to cover all popular conductor ranges. AH may also be ordered plated for general purpose use.

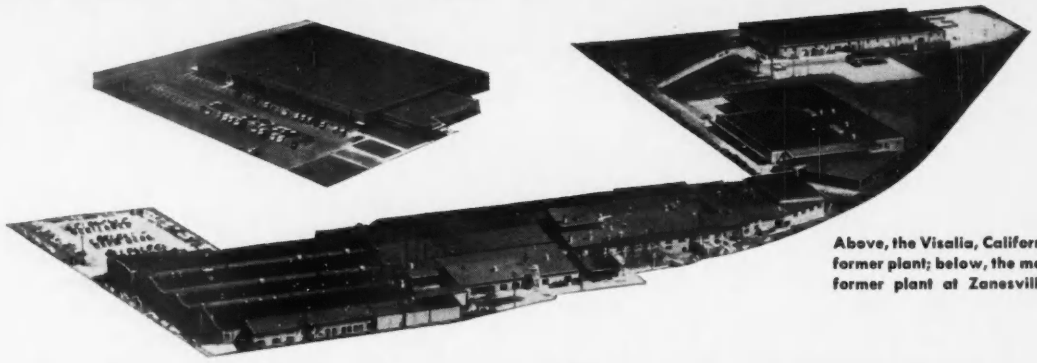
ANDERSON ELECTRIC CORPORATION • BIRMINGHAM 1, ALABAMA

ANDERSON ELECTRIC

Research / Quality / Performance / in Aluminum and Bronze Products

QUARTER CENTURY OF TRANSFORMER DESIGN RECALLS MANY L-M CONTRIBUTIONS

Silver Anniversary



Above, the Visalia, California transformer plant; below, the main transformer plant at Zanesville, Ohio.

L-M makes many contributions in 25 years of Transformer Design

1934: **L-M . . . the smallest transformer manufacturer in the industry**

1959: **L-M . . . the third largest producer of distribution transformers**

Back in 1934, Line Material had been in business for 23 years making a variety of distribution items for electrical utilities. With ambitious hopes and an earnest desire to offer even better products to the industry, L-M added distribution transformers to its line of products. Through the purchase of an existing transformer manufacturing company, L-M acquired ability, practical experience, and the services of some young engineers with new and then untried ideas.

A New Design Principle . . . In this atmosphere of youth, sincere ambition, and eagerness to do something better—which has always characterized Line Material—an entirely new, completely unorthodox, idea was born. This, today, is known as the Round-Wound transformer.

The Round-Wound transformer, with its exceptional and entirely unmatched performance characteristics, has been a major contribution of this company to the art of distribution transformer design.

Hundreds of L-M Developments . . . Line Material's research and development engineers have made literally hundreds of contributions to distribution equipment and practices. In distribution transformers, whose silver anniversary L-M is celebrating, are many that are well known to industry engineers and executives.

Oxidation-Resistant Transformer Oil . . . L-M was the first to introduce ORTO, an inhibited oil, as an aid to increased transformer life. The idea was soon quickly adopted by almost every manufacturer.

Obround-Smaller, Lighter . . . Line Material first introduced the obround tank shape, which made it possible to reduce size and weight without sacrificing performance characteristics.

L-M's Pad-Mount—The Better Way! Line Material was the first to design an aboveground transformer for underground service. L-M's Pad-Mount Transformer is generally recognized as a major contribution among those utilities facing the problem of developing underground distribution systems at the lowest possible cost.

Then—L-M SRT! Line Material's Self-Regulating Distribution Transformer is another outstanding L-M engineering development that still has not been matched in the industry.

Ask The L-M Field Engineer! L-M employs few "salesmen." Its men are *Field Engineers*—technical men with engineering degrees whose interest and responsibility are to serve the customer. That's why we always suggest, "Ask The L-M Field Engineer."

We say it now: Ask him—for information about Line Material, its services, its products, and especially, in this Silver Anniversary year, about the outstanding distribution transformers that are the proud product of this progressive, customer-minded company. Line Material Industries, Milwaukee 1, Wisconsin.

"Round-Wound," "ORTO," "Pad-Mount," and "SRT" are trademarks of Line Material Industries.

LINE MATERIAL Industries

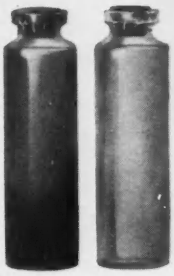
McGRAW-EDISON COMPANY

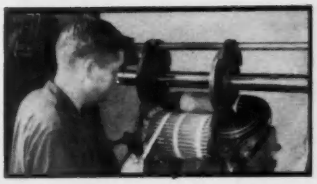
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

SOME L-M CONTRIBUTIONS TO TRANSFORMER DESIGN

ORTO (OXIDATION-RESISTANT TRANSFORMER OIL)

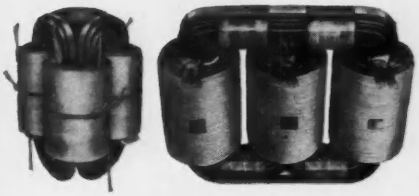
Line Material was the first to introduce an inhibited transformer oil that resists oxidation, acidity, and sludging. ORTO lasts several times as long as conventional transformer oil thus assuring longer transformer life. The advantages of this contribution were recognized and thereafter adopted by all major transformer manufacturers.





ROUND-WOUND TRANSFORMER

Round-Wound, is the first and only transformer with uncut, wound core and round coils wound directly on the core. This *Round*-coil, *Wound*-core is a balanced design that provides optimum overload capacity, long life, low losses, low exciting current, exceptionally good cooling, low regulation and exceptional mechanical features.



THE WOUND THREE-PHASE CORE

Other L-M firsts are the "Tri-Wound" and the "Uni-Wound" in three-phase designs. There are not just three single-phase cores in one tank. This continuously wound unitary core with round coils combines reduced size and weight with improved efficiency.

OBROUND TRANSFORMER TANK

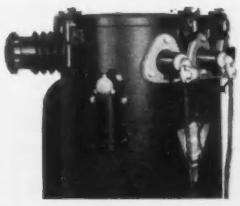
This innovation in tank manufacture reduced overall size and weight without reducing performance. The obround shape brings the center of gravity closer to the pole. This combination of lighter weight and shorter moment arm substantially decreases the total bending moment on the pole, and increases the potential capacity of transformer installations on the pole and crossarms.

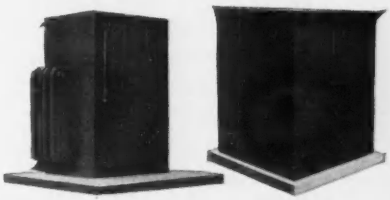
SRT (SELF-REGULATING TRANSFORMER)

The world's only Self-Regulating Distribution Transformer. It is a Round-Wound transformer with taps, and a hydraulic or electronic regulating mechanism sensitive to secondary voltage. The SRT switches primary taps to provide the desired transformation ratio. A significant departure in the field of voltage regulation, it corrects the voltage at the point of use.

TRANSFORMER THERMAL OVERLOAD INDICATOR

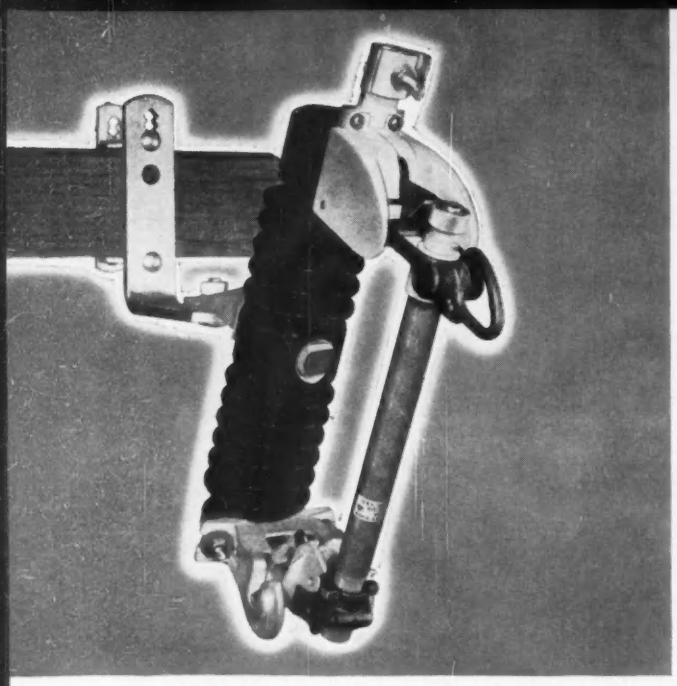
An externally mounted transformer overload indicator. Requiring no internal connection, it provides visible indication of overloads on transformers up to 100 kva by means of a drop-down indicator. Actuated by tank wall temperature, the device can be mounted on a bracket provided on all L-M transformers; or through the use of a permanent Alnico magnet mounting can be attached to any make of transformer. Ambient temperature-compensated, it is available with or without indicator light.



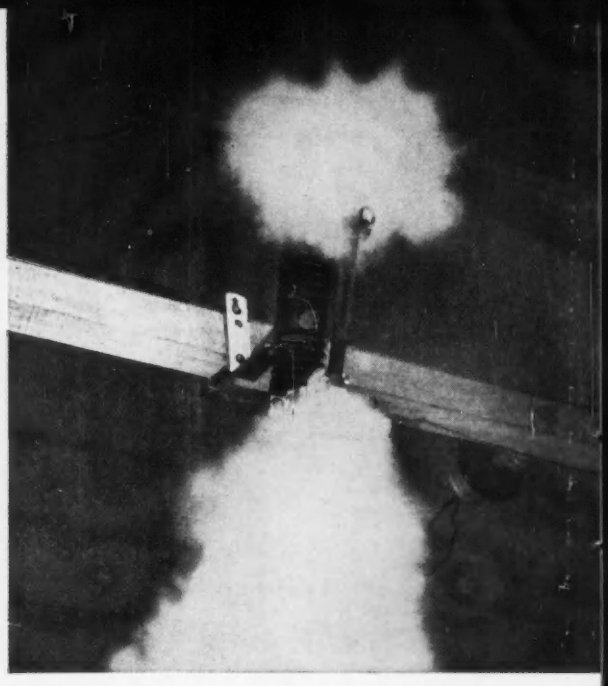


THE PAD-MOUNT AND TRANSCLOSURE

These units provide a convenient means of obtaining attractive, readily accessible transformer installations on underground distribution systems. Bridging the gap between overhead and subway installations, they are applicable for residential, commercial and industrial areas. The Pad-Mount (left) is a specially designed transformer with locked primary and secondary compartments. The Transclosure (right) is a versatile multisize ventilated steel housing for pole-type Round-Wound transformers, and all associated protective, control, and metering equipment.



LINE MATERIAL concentrates all engineering, testing and manufacturing efforts in one direction—*highest quality equipment for the electric power industry.* And L-M came to you to find what you wanted in the best possible open type fuse cutout. The New LMO incorporates every important feature you asked for.



A 240,000 kva TEST on a 15 kv 100 ampere Type LMO Distribution Cutout at L-M's Thomas A. Edison Short Circuit Laboratory. This cutout repeatedly interrupts 16,000 ampere faults. Many tests like this prove the LMO cutout *Totally Tested* under all possible operating conditions.

This New Totally Tested Distribution Cutout Has All Features Electric Utilities Wanted

Drawing upon its more than 35 years experience in the engineering, testing and manufacture of distribution fuse cutouts, L-M has produced the new Type LMO open type fuse cutout.

Totally Tested in L-M's Thomas A. Edison Short Circuit Laboratory at Franksville, Wisconsin, with hundreds of tests, the new Type LMO has proved reliability, proved interrupting capacity and proved safety through its entire operating range.

The new Type LMO distribution fuse cutout has all the important features you asked for. Features heading the list:

1. Non-ferrous construction
2. Positive latching
3. High interrupting capacity
4. Rugged multiple contacts
5. Complete birdproofing
6. Choice of terminals—aluminum or bronze
7. Spring loaded interlocking flipper

Get Complete Information. Ask your Field Engineer to show you: the sample of the new Type LMO cutout; the Type LMO Bulletin No. FC3; the Type LMO Movie. Contact your L-M Field Engineer or write Line Material Industries, Milwaukee 1, Wis. In Canada: CLM Industries, McGraw-Edison (Canada) Ltd., Toronto 13, Can.

TYPE LMO RATINGS

VOLTAGE RATING KV	CURRENT RATING AMPS	INTERRUPTING CAPACITY AMPERES—ASYMMETRICAL			
		HEAVY-DUTY		EXTRA-HEAVY-DUTY	
		Non-Expendable Cap	Expendable Cap	Non-Expendable Cap	Expendable Cap
7.8	100	5000	10000	10000	20000
15	100	4000	8000	8000	16000
27	100	3000	6000	—	—

Interchangeable Fuseholders: ratings may be changed simply by changing the fuseholder. Choice of heavy-duty or extra-heavy-duty fuseholders; 200-ampere disconnecting blade; link-break fuseholder. This interchangeability offers convenience and savings in labor, material, and stocking costs.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

SPECIALISTS IN DISTRIBUTION EQUIPMENT

434

DISTRIBUTION TRANSFORMERS • RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT

The Figures Are In; Let's Look at the Record

While utilities are generally conceded to be somewhat recession-proof, there's no denying their dependence on the health of the nation's economy.

Thus it was no surprise that a 1959 economy, jet-propelled by a well-heeled, big-spending population that pushed production to new highs, also set a few new records for electric utilities and closed out the frantic Fifties in a blaze of glory. The records have all been tabulated in Part 2 of Electrical World's 56th Annual Electrical Industry Statistical Report starting on page 71 of this issue. And while we recommend close inspection of these industry records, we would like to point out some highlights.

As always the sales figures (page 76) are particularly interesting. In total the industry racked up a pleasing 10.1% gain this past year. And while not quite up to some of the sensational 14 and 15% jumps of some years in the Fifties, it was the best gain since 1956. It also helped push the ten-year rate of gain to 152%, or 378 billion kwhr.

Industrial sales sparked the upturn by surging back from a 2.7% recession-induced decline in 1958 to a 10.2% gain in 1959. This shoved industrial sales to 303 billion kwhr—a 151% jump in the past decade. And it's particularly significant that this year's record was set despite a four-month steel strike and with no assistance from a static Atomic Energy Commission load.

Residential sales racked up a 9.1% gain last year, boosting the year's total to 173.5 billion kwhr—a jump of 199% in just ten years. And commercial sales, spurred by a booming economy, rose 11.1% to 112.4 billion kwhr—up 143% in the past ten years.

But probably the real achievement of the past decade was the industry's never-ending expansion in anticipation of these sales gains. In 1959 generating capacity additions (pages 72 and 88) added up to 13.5 million kw—slightly above the 13.2 million installed in 1958. This boosted total installed generating capacity to a record 156.6 million kw for a net increase of 93.5 million kw over the past decade.

And what's more important, the industry is still planning for future growth at a fairly healthy clip. In the next three years utilities add 35.4 million kw of new generating capacity. Disregarding retirements and rating adjustments this is a 22.6% increase.

That further expansion will require a great deal of capital is also obvious to the industry. In banking on the future economic growth of the nation, utilities' preliminary spending plans already call for the expenditure of more than $24.9 billion in the next five years (page 74). That's 14.5% more than was actually spent in the past five. And if the nation's economic growth lives up to expectations, these plans will probably grow considerably before the five years are up.

And there are other interesting statistics in this annual report. For instance, there's the station economics section on page 87 giving clear evidence to how joint technological advances by manufacturers and utilities have lowered the average amount of fuel required to produce a kwhr from 1.24 lb in 1949 to 0.89 lb in 1959.

And then there is the promise of future loads to be found in the detailed appliance sales statistics on page 84. It's clear from the saturation figures alone that the comforts of electric living still offer a tremendous load potential. And the retail sales figures show the potential is gradually being tapped.

Last but not least is the record of the electrical manufacturers (page 82), without whom the utility industry could not have chalked up such a record of expansion and technological advances. Here you'll see that this closely-allied industry also made headway in 1959 by racking up an 11.2% gain in sales.

Utilities Take a 'Wait-and-See'

No changes in purchasing policies are planned in wake of Philadelphia jury's charges; new presentments may involve turbines; manufacturers to be arraigned in March

The purchasing executives of electric utility companies are trying to keep close tabs on the investigations into possible price fixing. The most recent developments, however, came so swiftly and the ramifications range so widely that most of the equipment buyers prefer to wait and see what results from the federal grand jury's criminal indictments presented earlier this month.

These are the conclusions that followed talks with purchasing men in some of the bigger U. S. utilities. These executives apparently are going to wait until they have more facts before there will be purchasing policy changes, if any changes are made at all.

Actions Underway

The reticence is understandable in light of the number of firms and types of equipment involved, not to mention the grand juries doing the investigating. Here's a quick breakdown:

- The Philadelphia grand jury returned its first three criminal indictments against five companies and 18 individuals earlier this month, charging that the defendants conspired to fix and maintain prices on power switchgear assemblies, oil and air circuit breakers, and low-voltage power breakers (see table).
- Four more criminal indictments were handed down by the Philadelphia grand jury affecting manufacturers of bushings, insulators, lightning arresters, and open-fuse cutouts. These charged that price fixing and the submission of fixed price bids to public agencies had been occurring.
- Two new federal grand juries have been appointed to continue the anti-trust division's investigation of the electrical equipment industry. The investigation may involve transformers and turbine-generators.
- Meanwhile, the U.S. Justice Department has a grand jury investigation going in Milwaukee on the pricing policies of manufacturers of pole line hardware. This probe results from identical price complaints received by the Justice Department from competitors and not from buyers. The jury will be wrapping things up in April or May.

The defendants named by the old Philadelphia grand jury will be arraigned sometime in March, observers believe. One of three pleas will be open for the firms or their representatives: guilty, not guilty, or *nolo contendere*.

If the pleas are "not guilty," a trial will follow, probably sometime this autumn. The *nolo contendere* plea, frequently used, is not an admission of guilt and does not preclude the defendant from denying truth of the same charges in other suits.

One purchasing official had this to say about the alleged price fixing: "The whole thing dates back to the days of the NRA (National Recovery Act) when the government ordered companies to fix prices. The act was later ruled unconstitutional, of course, but the practice continued. I was in purchasing before NRA, and I know things have not been as competitive as before the act."

No Effect on Practices

Another purchasing executive said the indictments will not have much effect on his company's purchasing practices. There may be further price adjustments if the manufacturers find business is hard to get. There still is room for market pressures to operate," he said.

It's still too early to predict what pleas will be made, some observers say. They point out that recent federal anti-trust charges against oil producers and drug firms have been dismissed in recent months.

In addition, they add, the indictments mean that the grand jury only has some reason for believing that a statute has been violated, not that the person or company indicted actually committed or condoned a violation.

Statements issued by such as Judson Large, vice president and secretary of McGraw-Edison Co, denied involvement in price agreements. Said Large:

"Normally McGraw-Edison cannot expect to obtain higher prices for its products than those established by the largest companies in the industry and it is natural, therefore, that the prices of standardized products will not vary greatly from the prices established by major competitors. We think our products are better and we like to get as good a price as the 'big boys' charge.

Agreements Denied

"McGraw-Edison denies that the prices at which it sells its products have been determined as a result of meetings with its competitors. Prices quoted to government or municipal agencies are at the same level as those quoted to our normal utility customers. Much of the business for public authorities goes to foreign manufacturers whose costs are far below ours and we cannot meet their prices and make a profit."

The grand jury's action has altered some of the bidding abuses charged in the indictments, according to the general superintendent of a power board in a southern city. His view: "It looks like the boys carried the pitcher to the well once too often. Already we have been seeing beneficial results in the matter of prices on our little piece of business. It has not exactly been a 'white sale' but the prices have certainly been distinguished by their dissimilarity."

The indictment on power switchgear assemblies is, in some respects, typical of those handed down by the grand jury. The defendants and co-conspirators are charged with having "engaged in a combination and conspiracy in unreasonable restraint of trade . . ." from at least as early as 1956. The "unlawful combination and conspiracy is continuing and will continue unless the relief hereinafter prayed for is granted."

The companies involved allocated among themselves the sales of power switchgear assemblies to various federal, state and local government agencies before submitting bids on

Attitude on Jury Indictments

equipment, the indictment says. Under this set-up GE got 42% of the allocation, Westinghouse 38%, Allis-Chalmers 11% and I-T-E 9%, the grand jury charged. Federal Pacific Electric Co joined the meetings early in 1958, the indictment said.

Meetings between company representatives were held to agree on the list prices that switchgear would be sold to electric utility companies, industrial corporations and contractors, the indictment stated, but Federal Pacific Electric Co "would be permitted to quote prices at a specified differential below the prices quoted by other defendant manufacturers."

It was also agreed, the indictment charged, to allocate bids to federal, state and local governmental agencies according to the following approximate percentage shares: GE, 39%; Westinghouse, 35%; I-T-E, 11%; Allis-Chalmers, 8% and Federal Pacific, 7%.

Held 35 Meetings

"At least 35 such meetings were held between the middle of November 1958 and October 1959 . . ." where ". . . a scheme or formula for quoting nearly identical prices to electric utility companies, private industrial corporations, and contractors was used by defendant manufacturers, designated by them as a 'phase of the moon' or 'light of the moon' formula," the indictment stated. The indictment charged: "Through cyclic rotating positioning inherent in the formula, one defendant manufacturer would quote the low price, others would quote intermediate prices and another would quote the high price; and these positions would be periodically rotated among the manufacturers. This formula was so calculated that in submitting prices to these customers the price spread between defendant manufacturers' quotations would be sufficiently narrow so as to eliminate actual price competition among them, but sufficiently wide so as to give an appearance of competition. This formula permitted each defendant manufacturer to know the exact price it and every other defendant manufacturer would quote on each prospective sale."

The companion civil complaint "prayer," in calling for a halt to the alleged practices, also asks that the court order the defendants to cease utilizing any price formula and to issue new price lists on the basis of independent reviews of prices based on individual cost figures and on individual judgments as to profits figures.

A Check-List Of Indictments And Civil Complaints

	Companies Indicted														Offenses Charged									Civil Prayer			
	General Electric	Westinghouse	Allis-Chalmers	Federal Pacific	I-T-E Circuit Breaker	McGraw-Edison	Lapp Insulator	Ohio Brass	Porcelain Insulator	Joslyn	Hubbard	A. B. Chance	Southern States Eqpt.	H.K. Porter	Individuals	Fix prices	Allocate business	Submit rigged bids	Submit rigged quotations	Refrain from selling to competitors	Raise prices to competitors	Submit fixed price bids to public agencies	Enforce fixed price adherence by jobbers, etc.	Civil suit	Cease and desist	Issue new independent prices	Notify customers
*Power switchgear assemblies	✓	✓	✓	✓	✓										✓	✓	✓		✓	✓				✓	✓	✓	✓
Oil & air circuit breakers	✓	✓	✓	✓	✓										✓	✓	✓	✓						✓	✓	✓	✓
**I-v power circuit breakers	✓	✓			✓										✓									✓	✓	✓	
Bushings	✓	✓					✓	✓							✓						✓			✓	✓	✓	
Insulators	✓				✓	✓	✓	✓	✓			✓		✓	✓						✓	✓		✓	✓	✓	
Open fuse cutouts		✓			✓	✓				✓	✓	✓	✓		✓						✓						
Lightning arresters																											
Count I - Distribution	✓	✓				✓		✓		✓	✓			✓	✓						✓			✓	✓	✓	
Count II - Intermediate & station	✓	✓						✓							✓						✓			✓	✓	✓	
Count III - Arrester-cutout comb.	✓	✓				✓				✓	✓				✓						✓			✓	✓	✓	

*Named co-conspirators: McGraw-Edison, Moloney Electric, Wagner-Electric

**Named co-conspirators: Allis-Chalmers, Federal Pacific

Nuclear Research Needs Money

Administration's economy drive provides an opportunity for private industry to assume leadership in nation's nuclear generation research and development program

Congressional hearings on the state of the atom indicated that the Atomic Energy Commission's past announcements that the two West Coast utilities who were about to construct large-scale nuclear powerplants may have been too optimistic. In terms of time, Pacific Gas & Electric Co and Southern California Edison Co remain about 6 to 12 months away from reaching firm decisions to build full-size plants.

The commission's bill of item-by-item fiscal 1961 construction projects—sent to Capitol Hill in a separate action—also provides for no major reactor construction program for the coming year.

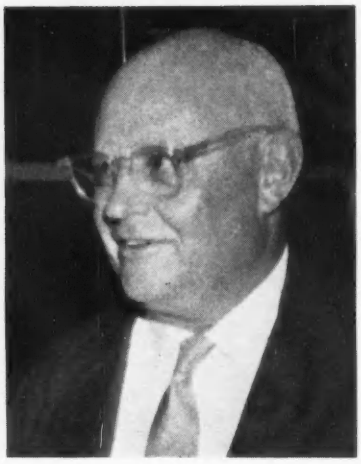
AEC Complimented

As for the 10-year reactor development program, reactor industry witnesses said that the AEC had performed an excellent job in Parts I and II of the study summarizing the current status of the atomic power industry. But the broad impression of their testimony was that the final part of the study outlining AEC's reactor development plans for the near future, and presented in the hearings last week by Chairman McCone, still reflected to a great extent the economy drive of the Administration. For instance, only one reactor—a $24-million test reactor—was explicitly requested by AEC in the bill recommending new construction starts.

Elmer L. Lindseth, president of Cleveland Electric Illuminating Co, speaking at the hearings as chairman of the Edison Electric Institute's Committee on Atomic Power, summarized participation of electric utility companies in the development of economically competitive nuclear power.

Lindseth summed up the utility program as follows:

"Three nuclear power plants in which investor-owned electric companies are participants are in operation; 11 company sponsored projects are under construction, design or contract; and three are in the planning stage, of which two are in active negotiations. The 14 projects that are either in operation, under construction or under contract involve utility company expenditures of $485 million and embrace six different reactor types. In total, these 17 nuclear power projects will involve utility expenditures of some $650 million and aggregate some 1.8-million kw."



LINDSETH: Remember the taxpayer

In light of these developments, Lindseth urged reduction in the federal government's role in commercial nuclear power so that nuclear power policy objectives "will be obtainable at minimum cost to the taxpayer."

In information furnished for the record, Lindseth informed the Joint Committee on Atomic Energy that Pacific G&E is probably closer to reaching a decision than Southern California Edison on a full-scale plant.

PG&E, according to information the utility furnished Lindseth's EEI committee, is continuing to study manufacturers' proposals for a reactor of commercial proportion and will do so until a satisfactory decision is made, presumably within the next few months. In addition, Lindseth noted that PG&E has recently acquired a site for a large A-plant.

Southern California Edison has received proposals from two reactor manufacturers, and it was pointed out that additional time is needed for evaluation before a decision may be reached to build a $60-million plant. Lindseth indicated that the utility was hopeful that evaluation of the proposals would be completed within the next six months.

New England Electric System is about two years away from selecting a reactor type with a capacity of over 200,000 kw for construction in the mid-Sixties, according to Lindseth's report.

Boiling Water Best?

Frank McCune, vice president for engineering services of General Electric Co, commended the spirit and effort of AEC's evaluation of reactor types in the 10-year study. After agreeing with AEC's statements on the importance of nuclear superheat developments, McCune stressed his belief that boiling water reactors held the best prospects for early attainment of economic nuclear power. "This, however, is a matter not for argument but for demonstration," he said.

Gas-cooled reactor systems and fast oxide breeders had sufficient potential, he said, to justify further developmental work, particularly in the nuclear materials area. GE studies had not shown a natural uranium heavy water prototype is likely to be economical in the U. S., he said.

Dr Chauncey Starr, general manager of the Atomics International Division of North American Aviation, warned against the major support provided light water reactor concepts under the 10-year plan as the only reactor systems which promise "economically interesting" power in the immediate future.

"There exists a responsibility to develop the best possible atomic power plants which both present and future technologies can produce," Starr said. Substantially less

support could bring organic, sodium and thorium epithermal reactors to the forefront.

An incomplete status summary of gas-cooled technology was presented by Part I of the 10-year study, according to Dr Frederic de Hoffmann, president of the General Atomic Division of General Dynamics. The Philadelphia Electric Co high temperature gas-cooled reactor now under construction will demonstrate in the first prototype plant features essential for economic power, de Hoffmann indicated.

In the bill of new construction items recommended by AEC, a request of $15 million was made for unsolicited proposals. As the commission spelled it out, this item would support bids from the utility industry to construct either full scale or prototype plants. It was indicated in the bill that the $45-million unsolicited proposal in this year's authorization would be used for the joint Consumers Power Co-General Electric proposal recently received by AEC.

On the condition that utilities do not choose to construct the organic moderated prototype called for under AEC's invitation issued in December, the commission also asked for $25 million for federal construction of the reactor. Again, however, if a utility were to construct the organic reactor, authorization was alternately requested for the same funds to be used to build either a spectral shift PWR or a small reactor at a remote military installation.

Four A-Projects Omitted

No new cooperative civilian power reactor is definitely included in AEC's bill, however. Amounts are explicitly earmarked for only one reactor of any sort—a $24-million advanced test reactor not designed to produce power. Total authorization requests proposed in the AEC bill add up to $171,256,000.

There was no request for a heavy water natural uranium prototype for which a $2.5-million study was authorized last year. Instead, $5 million was asked for use in a research and development joint program on heavy water moderated power plants between the U. S. and Canada.

No mention was made of further assistance to the Euratom power program — nor were additional funds requested. In the past two years, Congress has approved $10 million for the Euratom reactor program and its associated research and development program.

Neither did the bill mention installing 700,000-kw dual capacity in the NPR convertible production reactor authorized two years ago for Hanford, which joint committee Democrats have urged in the past. No funds were requested for the Stanford accelerator under physical research items.

Alterations to the Shippingport reactor were amended from the current year amount of $5 million to a figure of $9 million in the draft bill. The higher amount would permit operations at 150 Mw. But the extra steam above the present 100-Mw capacity would be dumped into a "heat sink."

Soviets Plan Three 1,400-Kv Dc Lines

McGraw-Hill World News—The Soviet Union says it plans to put at least three 1,400-kv dc transmission lines into operation during the next 20 years. These projects will be part of an expansion program that may help the U.S.S.R. to surpass the U. S. in total output and per capita consumption soon after 1975, or sooner.

Pyotr Neporozhny, deputy minister for construction of power stations, made these predictions in an interview published by Tass recently.

The lines will link systems of the European part of Russia with Siberia where large hydro and steam plants are planned. They will become the grid backbone for the nation, according to Neporozhny. He said that by 1975 the Soviets will generate 1.5-billion kwhr, nearly six times last year's figure. The Soviet prediction for U. S. generation in 15 years is about 1.5-billion kwhr. Edison Electric Institute, however, estimates total U. S. generation then as 2-billion kwhr.

One of the lines, the Tass article stated, will extend over 1,500 miles from the Yenisei region to northern Urals and will carry between 28-29-billion kwhr a year. A second line will link the southern Urals—a major iron and steel center—with central Siberia. The third line will transmit power from the future Lower Ob hydroelectric station near the Arctic Circle to Gorky or Volga region and Vologda region in northwestern European Russia.

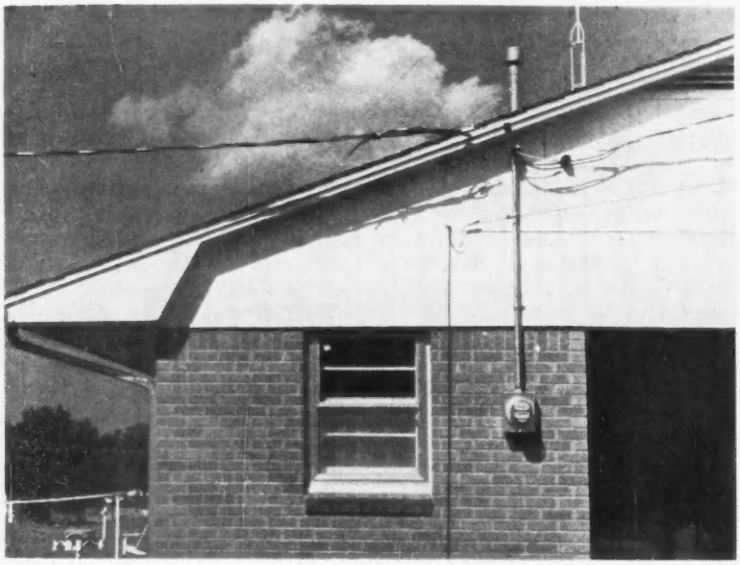
Locate Near Fuel

The Russian plan involves constructing generating stations near virtually unlimited coal deposits in Siberia and transmitting power to the major load centers. The thermal stations will receive construction priority with capacities ranging from 1,200 to 2,400 kw. Beginning next year all thermal power stations of these capacities will be built with standard "economical" designs.

Hydroelectric stations will be located where unit cost is low, and industries will grow around them.

Largest of the hydro chains will be on the Yenisei River, and a number of hydroelectric stations are planned for the River Amur in the Far East. Capacities of these will be from 1-million to 3-million kw. At the end of the 20 year period a 20-million kw station is to be constructed on the River Lena.

The giant dc transmission lines play an important part in the present Seven Year Plan as well as the longer range Twenty Year Plan. Mergers of smaller power grids are already underway, with the latest being a 500 kv link between Stalingrad and Moscow that went into service Dec. 27. This is an important link in a grid that includes 17 systems controlled from Moscow. By the end of the Seven Year Plan this grid will include 30 more systems.



Plenty of Power—Public and Private

This is an example of what is happening in South Fulton, Tenn., as the Weakley County Municipal Electric System takes over customers of Kentucky Utilities Co. WCMES, a distributor of TVA power, received a franchise from South Fulton last year after the KU franchise expired in September, 1958.

Instead of taking over KU facilities WCMES is overbuilding. The result is shown here with the KU service at the right and the new service at the left ready for cutover.

Burns Creek Action Stalls in House

Action on the highly controversial Federal Burns Creek "reclamation" project has been stalled in the House Interior Committee until the irrigation and reclamation subcommittee can find more time—probably in mid-March—to complete hearings.

What had been billed as a rapid two-or-three-day hearing to complete testimony on Burns Creek, followed by a just-as-rapid subcommittee vote, collapsed when witnesses took more time than planned, and the subcommittee ran out of time to hear them.

When the subcommittee resumes hearings on Burns Creek (the group shares hearing time with four other subcommittees and the main committee), it will hear and question spokesmen from the Bureau of Reclamation. No other witnesses will be heard, as now planned, and the group should then be in a position to vote on the project.

The delay is a considerable blow to Rep Gracie Pfost (D-Ida.), who was pushing Subcommittee Chairman Walter Rogers (D-Tex.) to complete hearings and vote on the project this month. Pfost, strongly in favor of Burns Creek, lost a bid in the 1959 session of Congress to push the bill through the full Interior Committee without action by the subcommittee.

Actually, the delay may work to the advantage of Burns Creek supporters, because much of the fire of ardent testimony against the project will be forgotten by mid-March.

The bill's supporters are conceded to have the upper hand, strengthened by the fact that the Senate has approved the project and appropriations have been approved —and signed by Pres Eisenhower.

BPA-PG&E Tie . . .

. . . okayed in final report to Interior Committee; contract delay is likely

A final report favoring Pacific Gas & Electric's proposed 230-kv transmission connection with the Bonneville Power Administration has been submitted to the Senate Interior Committee by Interior Secretary Fred Seaton.

The final report is substantially the same—except for "cleaned up" wording—as the department's preliminary report, released last month (EW, Feb. 8, p 32).

The department points out that the proposed line—to be built by California-Oregon Power from Bonneville's Klamath Falls terminal to the Oregon-California line, and by PG&E from that point to its Pit 3 plant—is both economically feasible and desirable. Surplus Bonneville power would be integrated into the PG&E system to permit backing off of thermal generation in the company's San Francisco load center.

The department holds to its position in the preliminary report that a larger-capacity line (recommended by Federal power supporters) would not pay off, and that co-ordination of Bonneville with the Central Valley Project over such a line would have no benefits to Central Valley customers. This is because no firm power benefits—necessary for Central Valley use—could be found in utilizing the line.

Seaton added that the proposed line would displace up to 1.3-million barrels of fuel oil—or its equivalent—in thermal generation annually in California. He said also that a second 230-kv line would be economically feasible between California and Bonneville, but "only one 230-kv line is financially feasible on the basis that the Bonneville Power Administration sells the surplus secondary energy at its established rates within its service area."

The committee probably will hold hearings on the final Bonneville report in early March, and if it requests—as expected—another delay in the PG&E contract with Bonneville, it's unlikely that any decision will be reached before Congress adjourns.

SENDING UNIT shares pole with supplying transformer and recloser is on pole at left, beyond radio equipment

RECEIVING UNIT converts digit tone signals to numbers which it prints on tape to report recloser lock out

Radio Reports Recloser Operation

Prompt reporting of recloser operation to system headquarters via two-way radio is visualized in an experiment being conducted on the Corn Belt Electric Cooperative system near Bloomington, Ill. The equipment, developed by Motorola, Inc, has two main parts: A sending unit on a pole near the recloser installation, and a receiving unit at Bloomington headquarters.

Operation of the remote alarm indicator equipment has been authorized by FCC on the same frequency as the two-way radio system for dispatching crews and troublemen. Power input to the final radio frequency power amplifier is limited to 50 w. For this service FCC permits transmission of a signal for 3 sec once each minute for 5 min.

Two sending units have been installed in 3-kva transformer cases. The sending unit is a standard two-way mobile 25-w radio transmitter with a few modifications. To assure reliability the transformer case is sealed, and the sending unit is kept under air pressure of 8 to 10 psi to halt condensation and icing.

The sending unit in its transformer tank is mounted on a pole one span from the recloser which it monitors. One span of wire is installed between the recloser and the radio sending unit. Power for the sending unit is supplied by a small transformer, 200-w capacity being sufficient, mounted also on the pole. This equipment is between the recloser to be monitored and the power source, so that opening of the recloser does not cut off power supply to the sending unit.

Starts Motor

The actuating switch for the sending unit is mounted on the recloser in such a position that it is tripped by the recloser handle when the latter operates after lockout of the recloser. When the recloser handle operation closes the actuating switch on the radio sending unit the timer motor is started and power is applied to the 30-sec delay relay. After 8 sec a ganged switch is closed, starting the 5-min timer. The timer motor operates 5 min.

The 5-min interval is the limit set by FCC as the duration of the tone signals. At the end of 5 min the actuating switch is opened, and all equipment stops. After 2 min the contacts of the delay relay again close and automatically reset the sender unit for its cycle.

When the radio sending unit is actuated by operation of the recloser handle, it sends out a series of digit tones that are received and printed by the receiving unit. The digit tones are sent sequentially to designate the recloser number which tells the dispatcher immediately where to send the troubleman and what section of feeder is out. The digit-tone signals are completed in 3 sec. They are repeated every 60 sec for 5 min to minimize interference to reception of the signal.

About 10 sec after the last tone signal is transmitted the 5-min timer opens the switch, preventing further transmissions.

The receiving unit is connected continually to the base station receiver. As each digit tone is received from the sending unit, the corresponding digit solenoid pushes the digit key on the printer and shifts the printer one space to be ready for the next. The receiver prints the series of digits on a tape which tells the dispatcher that a recloser operated and locked out.

Two or three digits can be sent. The equipment can be set up to handle up to 99 recloser installations with one arrangement and up to 290 with another. With slight modifications up to 999 can be handled.

ARCHITECTURAL TREATMENT of tilt-up concrete walls plus landscaping makes such outdoor distribution substations congruous in residential and commercial areas of Los Angeles, and its economics also favor such installations

Roofless, Congruous, Less Costly

30 to 50-Mva substations, used for Los Angeles distribution since 1952, are in residential, commercial areas

R. K. MORTON, Electrical Engineer, Los Angeles Department of Water & Power, Los Angeles, Calif.

Roofless structures with decorative walls and landscaping make Los Angeles Department of Water & Power outdoor distribution substations compatible with their surroundings, whether residential or commercial. These 30 to 50-Mva substations cost about 75% as much as a conventional indoor substation. The department has been developing this construction since early 1952.

A 22-ft-high wall enclosing the substation simulates a building. The wall is pre-cast, tilt-up concrete panels supported by columns inside the cast-in-place concrete or by exposed, galvanized steel. Either column is supported by bored footings, but ordinarily grade beams are not provided. Panels are welded to the columns by cast-in welding inserts.

The unroofed structure makes practicable the steel equipment racks, concrete equipment pads, and gravel fill for the yard. The control house is either of tilt-up concrete or pre-fabricated steel when it is inside the enclosure. Fire protection, ventilation, and drainage present the same problems as at a conventional outdoor substation.

Personnel access is through the control house, or through a simulated entrance in the wall. Equipment comes through a 16 by 20-ft entrance, closed by rolling or sliding steel doors. The entrance is on a driveway through the center of the substation and divides the 34.5 from the 4.8-kv portions.

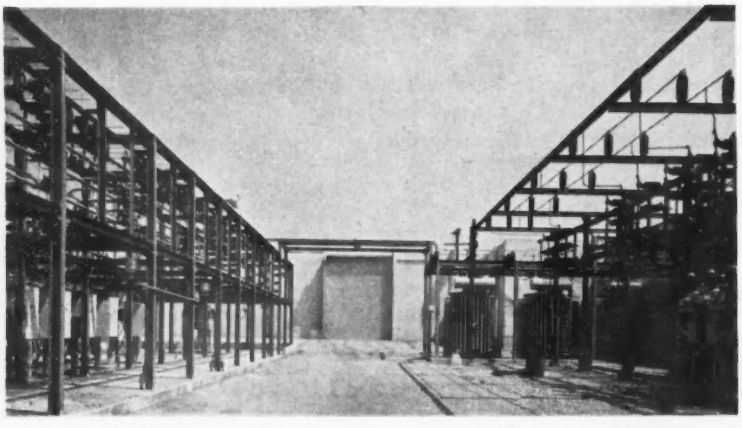
A subtransmission voltage of 34.5-kv grounded-wye provides network supply by means of three to six underground entrance lines. Two transformer banks, each three single-phase units connected delta-delta, are at the ends of the 34.5-kv equipment rack. Each bank is connected selectively through a single breaker and double disconnect switches to either of two 34.5-kv buses.

Bridge Driveway

The 4.8-kv transformer buses are carried over the driveway on rack bridges at each end of the substation, except at 30-Mva substations where underground cables make this connection. A double main-and-transfer bus arrangement is used in the 4.8-kv part. From 16 to 20 4.8-kv ungrounded delta, regulated, radial feeders leave the substation underground.

In an alternate design, transformer banks are next to and at the center of the 4.8-kv rack with overhead feed from the 34.5-kv rack. This arrangement permits omission of the end portions of racks and pads, which can be extended later as the substation grows.

Normally unattended, the substations are remotely controlled through supervisory equipment in the control room. The latter houses a control and relay switchboard, battery with charger, and communication equipment.



INTERIOR VIEW of the substation shows equipment entry gate, the 34.5-kv rack on the right, and the 4.8-kv rack on the left. The substation is unattended

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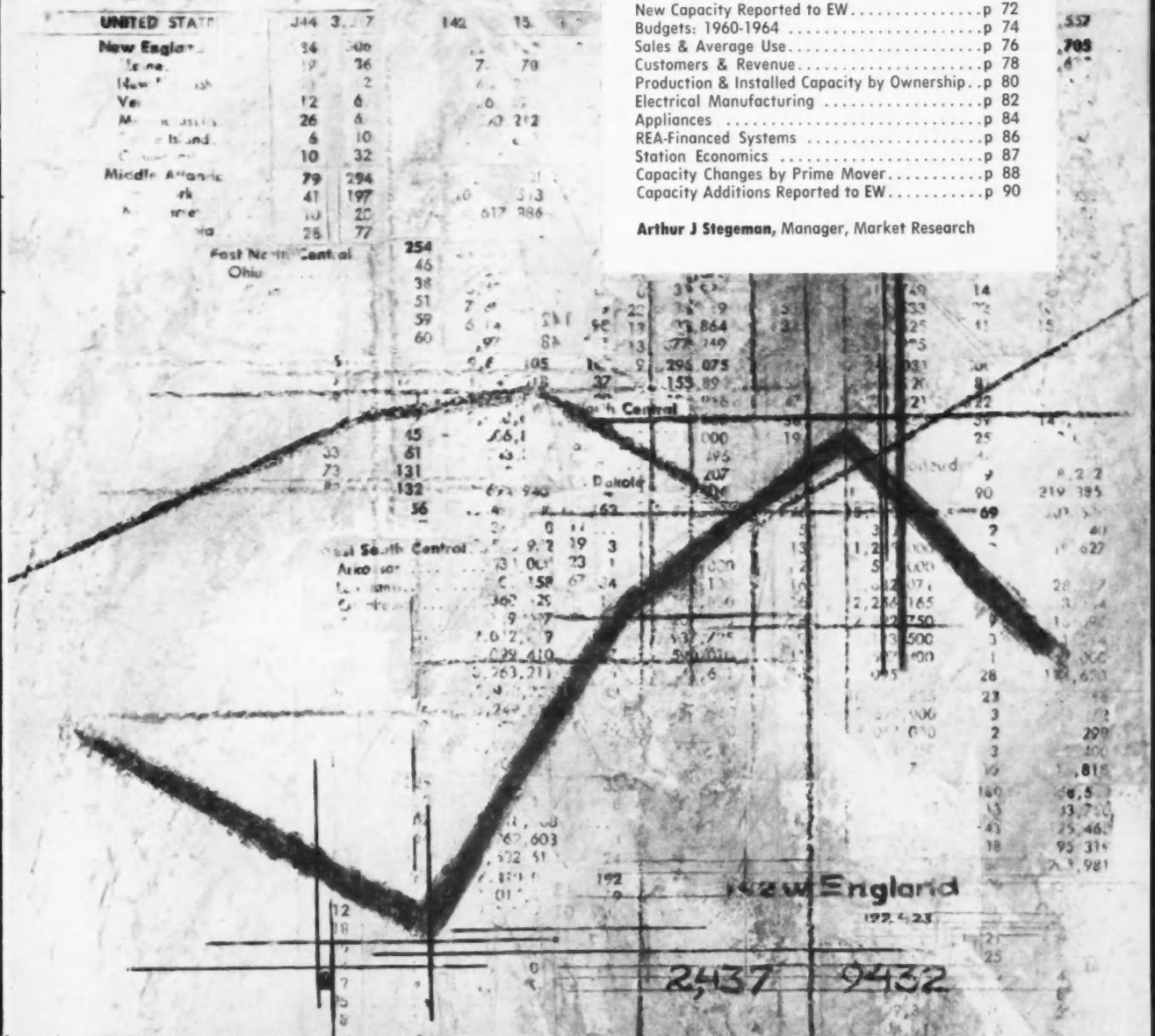
Arthur J Stegeman, Manager, Market Research



Electrical World Industry Statistics

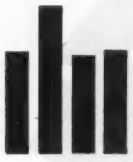
56TH ANNUAL REPORT

Part 2

NEW CAPACITY

Utility Plans Call for 58,387 Mw of New Capacity

1959 — 1,649.4 (12.2%)
1960 — 2,334.0 (17.8%)
1961 — 1,574.0 (14.4%)
1962 — 1,656.5 (14.5%)



Pacific

1959 — 319.4 (2.4%)
1960 — 475.0 (3.6%)
1961 — 667.7 (6.1%)
1962 — 593.0 (5.2%)

Mountain

Source: Electrical World Survey.
All bars from left to right: 1959, 1960, 1961 and 1962.

Despite a high rate of capacity additions over the last few years electric utilities in the continguous United States are planning to add another 58,387 Mw to the nation's generating capacity, according to Electrical World's latest annual survey. This compares with the 60,895 Mw planned at this time last year. However, in evaluating this new figure remember it follows the installation of a record 13,542 Mw in 1959 and 13,246 Mw in 1958.

More than 60% of the total, or 35,425 Mw, is scheduled to be added by year-end 1962. Of this, 13,092 Mw or 37% is scheduled for 1960, 10,910 Mw or 30.8% is scheduled for 1961 and 11,423 Mw or 32.2% is scheduled for 1962.

The remaining 22,962 Mw or 39.3% of the total is for "after 1962" indicating utilities are still planning capacity requirements well in advance. Although, this year, the "after" figure consists of only 10,243 Mw for steam, or 44.6% of the total, compared with 50.3% at this time last year indicating long-range plans are slightly less firm than a year ago.

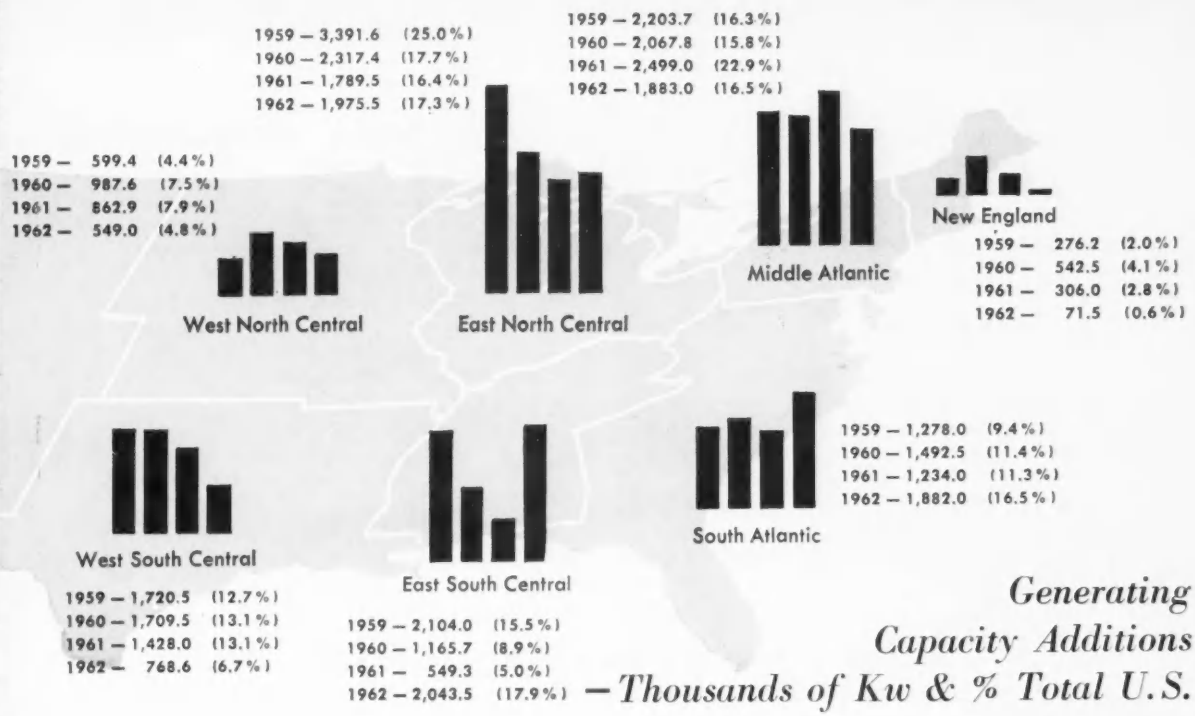
However, it's interesting to note that for the first time since 1957 yearly plans do not show a steady decline from the current year. This apparently is another indication that the new-orders drought has passed. However, at this point it seems premature to interpret this upturn as a signal for a rush of new orders. In fact looking at the plans year by year and "after 1962" it would seem that some semblance of ordering stability has finally hit generating apparatus with yearly new orders fluctuating in the 10,000 to 12,000 Mw range.

Investor-owned power companies will install 25,760 Mw or 72.7% of the planned capacity additions in the next three years. Municipal, state and power district systems will install 5,715 Mw or 16.1%, federal agencies will add 3,461 Mw or 9.8% and cooperatives will add 489 Mw or 1.4%.

However, when you look at the "after 1962" totals you will find that power companies account for only 10,633 Mw or 46.3% of the total while federal agencies represent 8,438 Mw or 36.7% and municipal, state and power district systems 3,747 Mw or 16.3%. Of course, these federal figures are mainly hydro plant additions which could, and undoubtedly do, represent planning through 1975 or beyond.

Regionally the Pacific area is out front in total capacity additions now planned with 12,844 Mw. However, here again, the greater share or 9,954 Mw is in hydro reflecting federal plans in that area. Next in line as usual is the Middle Atlantic with 7,379 Mw and almost matching it is East North Central with 7,238 Mw followed closely by South Atlantic with 7,058 Mw. West South Central follows with 6,941 Mw. New England is low with only 1,800 Mw planned.

For a company by company



Generating Capacity Additions — Thousands of Kw & % Total U.S.

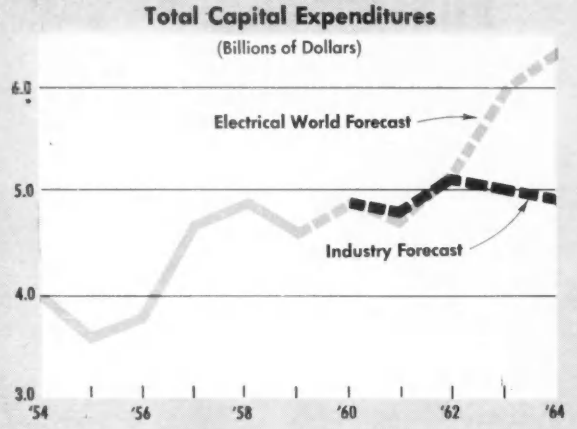
Capacity Additions Reported to Electrical World—Kw†

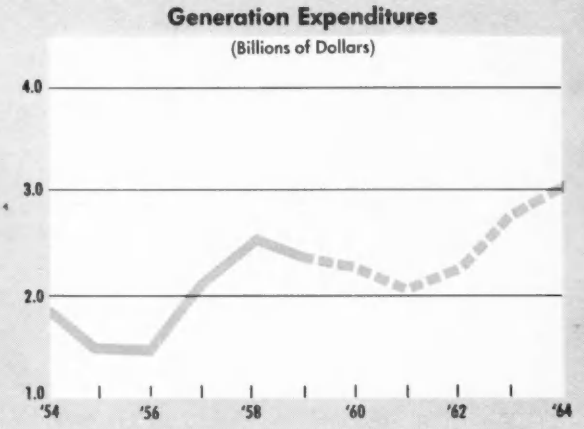
	1959	1960	1961	1962	After 1962
Hydro					
Power Companies	530,200	274,000	390,250	480,000	2,333,200
Municipal, State and Power District Systems	559,000	898,500	2,223,000	1,112,500	1,912,250
Cooperatives	.....	.....	500	4,500	.....
Federal Agencies	456,500	532,000	852,000	477,700	8,437,950
Total	**1,545,700**	**1,704,500**	**3,465,750**	**2,074,700**	**12,683,400**
Steam					
Power Companies	9,689,480	10,072,455	6,763,500	7,610,000	8,297,650
Municipal, State and Power District Systems	1,174,400	481,650	479,700	452,500	1,801,000
Cooperatives	120,450	267,000	99,000	114,000	144,000
Federal Agencies	950,000	500,000	.....	1,100,000	.....
Total	**11,934,330**	**11,321,105**	**7,342,200**	**9,276,500**	**10,242,650**
Internal Combustion					
Power Companies	17,200	32,250	79,500	57,500	2,000
Municipal, State and Power District Systems	28,463	33,800	19,400	13,860	33,925
Cooperatives	16,400	150	3,500	.....	.....
Federal Agencies	.....	.....	.....	.....	.....
Total	**62,063**	**66,200**	**102,400**	**71,360**	**35,925**
Total					
Power Companies	10,236,880	10,378,705	7,233,250	8,147,500	10,632,850
Municipal, State and Power District Systems	1,761,863	1,413,950	2,722,100	1,578,860	3,747,175
Cooperatives	136,850	267,150	103,000	118,500	144,000
Federal Agencies	1,406,500	1,032,000	852,000	1,577,700	8,437,950
Total‡	**13,542,093**	**13,091,805**	**10,910,350**	**11,422,560**	**22,961,975**

Source: "Electrical World" Surveys. †Maximum rated capability. ‡Contiguous U. S.

listing of yearly capacity additions reported to EW see page 90

BUDGETS: 1960-1964





Preliminary Five-Year Utility Budgets

The nation's electric utilities are already planning to spend 14.5% more on expansion in the next five years than they have in the past five according to results compiled from Electrical World's latest annual survey of utility construction and expenditures.

Utilities plan to spend $24,865 million on new plant and equipment in the period beginning January 1960 and ending December 1964. In the previous five-year period the industry spent $21,725 million.

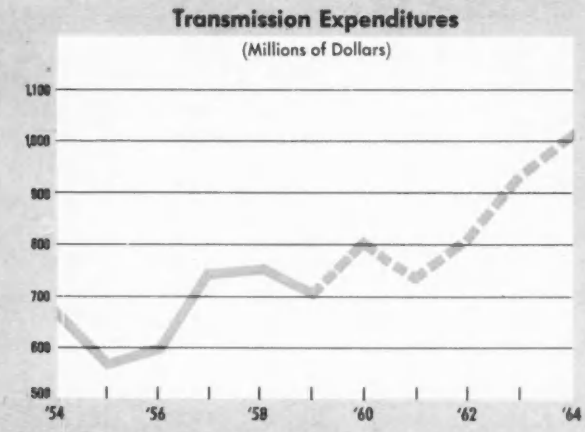
As reported on January 25, 1960, the industry plans to spend $4.9 billion in 1960—4.9% more than last year. Beyond 1960, preliminary spending plans are: $4,847 million in 1961—down 1.1% from 1960; $5,149 million in 1962—up 6.2% over 1961; $5,037 million in 1963—down 2.2% from 1962; and $4,932 million in 1964—down 2.1% from 1963.

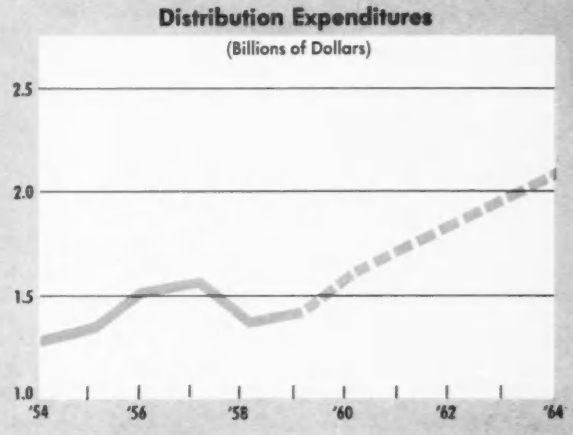
These industry forecasts tend to substantiate Electrical World's annual industry forecast of September 14, 1959 (table below and chart above). For instance, they both call for a downturn in 1961 although EW's prediction is slightly lower than the industry's forecast. In 1962 they are close with both rising. Beyond '62 the forecasts diverge with EW's rising and the industry's falling. But this is the nor-

Electric Utility Capital Expenditures

	Generation	Transmission	Distribution	Miscellaneous	Total
1954	1,940	666	1,288	122	4,016
1955	1,548	571	1,343	161	3,623
1956	1,479	598	1,518	186	3,781
1957	2,234	747	1,566	199	4,746
1958	2,582	764	1,373	187	4,906
1959	2,369	708	1,413	180	4,669
1960‡	2,283	813	1,595	209	4,900
Electrical World Forecast—September 14, 1959					**Industry Forecast**
1961	2,110	752	1,709	183	4,754	4,847
1962	2,341	822	1,842	200	5,205	5,149
1963	2,827	935	1,972	229	5,963	5,037
1964	3,062	1,007	2,112	247	6,428	4,932

Source: Electrical World Surveys. 1954–1959 Actual. ‡ Prospective





Up 14.5% Over 1954-59 Spending

mal pattern in long-range plans. Experience shows they usually increase as time passes.

East North Central region plans to spend $4,395 million or 17.7% of the industry's five-year budget of $24,865 million. Next is the Pacific region with $3,845 million or 15.5% followed closely by the Middle Atlantic with $3,831 million or 15.4%. The remainder stack up as follows: South Atlantic —$3,422 million, West South Central—$2,513 million, West North Central $2,282 million, East South Central—$1,965 million, Mountain—$1,498 million and New England $1,114 million.

Additional data on the major types of utility expenditures for 1961 were also obtained. But since returns giving this breakdown were such a relatively small part of the overall coverage it was impossible to relate the indicated changes to the entire industry.

However, here are the changes from 1960 to '61 indicated by this group of companies. On the downside were generation and "miscellaneous" expenditures showing drops of 17.0% and 1.2% respectively. On the upside were transmission and distribution spending with distribution racking up a 7.3% gain over 1960 and transmission up 3.2%.

—Millions of Dollars

(By Regions 1959–1964)

	1959†	1960	1961	1962	1963	1964
New England	183	198	210	198	252	256
Middle Atlantic	1,032	1,011	817	685	631	688
East North Central	712	779	784	872	862	1,098
West North Central	376	447	415	463	491	466
South Atlantic	613	663	714	684	749	612
East South Central	389	423	412	368	404	358
West South Central	454	437	436	541	548	551
Mountain	197	236	303	338	315	306
Pacific	713	707	756	1,000	785	597
Total United States*	**4,669**	**4,900**	**4,847**	**5,149**	**5,037**	**4,932**

Source: Electrical World's 1959–60 Survey. * Contiguous U. S. † Actual.

SALES

Across-The-Board Gains Jump Sales

(Millions of kwhr)

	Residential			Rural*			Small Light & Power		
	Sales	% Total	% Change	Sales	% Total	% Change	Sales	% Total	% Change
1943	28,621	15.4	6.3%	2,996	1.6	3.7%	28,192	15.2	3.5%
1944	31,266	15.7	9.2%	3,373	1.7	12.6%	29,837	15.1	5.8%
1945	34,184	17.7	9.3%	3,669	1.9	8.8%	30,438	15.7	2.0%
1946	38,571	20.2	12.8%	4,431	2.3	20.8%	33,016	17.3	8.5%
1947	44,171	20.3	14.5%	5,551	2.5	25.3%	38,379	17.6	16.2%
1948	50,978	21.2	15.4%	6,327	2.6	14.0%	43,193	17.9	12.5%
1949	58,139	23.4	14.0%	7,384	3.0	16.7%	46,262	18.6	7.1%
1950	67,030	23.9	15.3%	7,400	2.6	0.2%	50,446	18.0	9.0%
1951	77,024	24.2	14.9%	8,479	2.7	14.6%	57,278	18.0	13.5%
1952	86,780	25.3	12.7%	8,536	2.5	0.7%	62,080	18.1	8.4%
1953	97,063	25.3	11.8%	9,613	2.5	12.6%	69,208	18.0	11.5%
1954	108,465	26.4	11.7%	10,176	2.5	5.9%	73,373	17.9	6.0%
1955	120,524	25.1	11.1%	10,751	2.2	5.7%	80,759	16.8	10.1%
1956	133,851	25.2	11.1%	11,098	2.1	3.2%	87,743	16.6	8.6%
1957	147,059	26.4	9.9%	11,290	2.0	1.7%	95,142	17.1	8.4%
1958	159,047	27.9	8.2%	11,084	1.9	−1.8%	101,213	17.8	6.4%
1959‡	173,450	27.7	9.1%	12,975	2.1	17.1%	112,400	17.9	11.1%

Source: Edison Electric Institute. * Sales on distinct rural rates. ‡Estimated.

AVERAGE USE

211 Kwhr Boost in 1959 Pushes

	Residential				Small Light	
	Average Use		Average Bill		Average Use	
	Kwhr	Change	per Kwhr	Annual	Kwhr	Change
1943	1,070	48 (4.7%)	3.60¢	$38.52	6,722	368 (5.8%)
1944	1,151	81 (7.6%)	3.51¢	$40.40	7,080	358 (5.3%)
1945	1,229	78 (6.8%)	3.41¢	$41.97	7,062	−18 (0.3%)
1946	1,329	100 (8.1%)	3.22¢	$42.79	7,224	162 (2.3%)
1947	1,438	109 (8.2%)	3.09¢	$44.43	7,915	691 (9.6%)
1948	1,563	125 (8.7%)	3.01¢	$47.05	8,535	620 (7.8%)
1949	1,684	121 (7.7%)	2.95¢	$49.68	8,871	336 (3.9%)
1950	1,830	146 (8.7%)	2.88¢	$52.70	9,320	449 (5.1%)
1951	2,004	174 (9.5%)	2.81¢	$56.31	10,432	1,112 (11.9%)
1952	2,169	165 (8.2%)	2.77¢	$60.08	11,106	674 (6.5%)
1953	2,346	177 (8.2%)	2.74¢	$64.28	12,007	901 (8.1%)
1954	2,549	203 (8.7%)	2.69¢	$68.57	12,353	346 (2.9%)
1955	2,751	202 (7.9%)	2.64¢	$72.63	13,422	1,069 (8.7%)
1956	2,969	218 (7.9%)	2.60¢	$77.19	14,395	973 (7.2%)
1957	3,174	205 (6.9%)	2.56¢	$81.25	15,432	1,037 (7.2%)
1958	3,366	192 (6.0%)	2.53¢	$85.16	16,181	749 (4.9%)
1959‡	3,577	211 (6.3%)	2.51¢	$89.78	17,725	1,544 (9.5%)

Source: Edison Electric Institute. ‡ Estimated.

10.1% to 626.6 Billion Kwhr

(Millions of kwhr)

	Large Light & Power			Other Classifications			Total	
	Sales	% Total	% Change	Sales	% Total	% Change	Sales	% Change
1943	106,657	57.4	20.7%	19,423	10.4	3.9%	185,889	16.6%
1944	115,187	58.1	8.0%	18,497	9.3	4.8%	198,160	6.6%
1945	107,490	55.5	6.7%	17,777	9.2	3.9%	193,558	2.3%
1946	98,885	51.8	8.0%	15,892	8.3	10 6%	190,795	1.4%
1947	113,523	52.2	14.8%	15,957	7.3	0.4%	217,581	14.0%
1948	124,088	51.6	9.3%	16,154	6.7	1.2%	240,740	10.6%
1949	120,766	48.6	2.7%	15,991	6.4	1.0%	248,542	3.2%
1950	139,065	49.5	15.2%	16,598	5.9	3.8%	280,539	12.9%
1951	157,827	49.6	13.5%	17,560	5.5	5.8%	318,168	13.4%
1952	167,358	48.9	6.0%	17,770	5.2	1.2%	342,524	7.7%
1953	190,010	49.5	13.5%	18,350	4.8	3.3%	384,244	12.2%
1954	200,155	48.7	5.3%	18,735	4.6	2.1%	410,904	6.9%
1955	249,206	51.8	24.5%	19,681	4.1	5.0%	480,921	17.0%
1956	276,647	52.2	11.0%	20,789	3.9	5.6%	530,128	10.2%
1957	282,734	50.7	2.2%	21,604	3.9	3.9%	557,829	5.2%
1958	275,023	48.3	−2.7%	22,794	4.0	5.5%	569,161	2.0%
1959‡	303,000	48.4	10.2%	24,725	3.9	8.5%	626,550	10.1%

Average Residential Use to 3,577 Kwhr

and Power		Total Ultimate Customers				
Average Bill		Average Use		Average Bill		
per Kwhr	Annual	Kwhr	Change	per Kwhr	Annual	
2.74¢	$184	5,753	773 (15.5%)	1.66¢	$95.50	1943
2.74¢	$194	6,047	294 (5.1%)	1.65¢	$99.78	1944
2.79¢	$197	5,762	−285 (4.7%)	1.73¢	$99.68	1945
2.80¢	$202	5,422	−340 (5.9%)	1.81¢	$98.14	1946
2.69¢	$213	5,828	406 (7.5%)	1.77¢	$103.16	1947
2.67¢	$228	6,073	245 (4.2%)	1.79¢	$108.71	1948
2.66¢	$236	5,937	−136 (2.2%)	1.86¢	$110.43	1949
2.64¢	$246	6,377	440 (7.4%)	1.81¢	$115.42	1950
2.55¢	$266	6,922	545 (8.5%)	1.78¢	$123.21	1951
2.55¢	$283	7,183	261 (3.8%)	1.79¢	$128.58	1952
2.53¢	$304	7,815	632 (8.8%)	1.77¢	$138.33	1953
2.52¢	$311	8,127	312 (4.0%)	1.77¢	$143.85	1954
2.47¢	$332	9,265	1,138 (14.0%)	1.67¢	$154.73	1955
2.45¢	$353	9,944	679 (7.3%)	1.64¢	$163.08	1956
2.42¢	$373	10,214	270 (2.7%)	1.67¢	$170.57	1957
2.41¢	$390	10,227	13 (0.1%)	1.71¢	$174.88	1958
2.37¢	$420	11,020	793 (7.8%)	1.69¢	$186.24	1959‡

CUSTOMERS

1.27 Million Additions in 1959 Push

	Residential			Rural*			Small Light & Power		
	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	% Total	Annual Change
1943...	26,872,639	82.9	252,183	1,088,698	3.4	−6,814	4,168,245	12.8	−51,212
1944...	27,371,260	82.8	498,621	1,144,241	3.5	55,543	4,263,395	12.9	95,150
1945...	28,116,998	82.6	745,738	1,234,441	3.6	90,200	4,398,184	12.9	134,789
1946...	29,769,107	82.3	1,652,109	1,381,291	3.8	146,850	4,692,850	13.0	294,666
1947...	31,621,959	82.2	1,852,852	1,522,136	4.0	140,845	4,960,895	12.9	268,045
1948...	33,549,396	82.4	1,927,437	1,694,579	4.1	172,443	5,131,730	12.6	170,835
1949...	35,375,366	82.6	1,825,970	1,804,415	4.2	109,836	5,290,768	12.3	159,038
1950...	37,532,549	83.4	2,157,183	1,596,146	3.5	−208,269	5,466,181	12.2	175,413
1951...	39,224,621	83.8	1,692,072	1,658,728	3.5	62,582	5,528,117	11.8	61,936
1952...	40,738,718	84.1	1,514,097	1,663,201	3.4	4,473	5,634,130	11.6	106,013
1953...	41,981,633	84.1	1,242,915	1,621,810	3.3	−41,391	5,863,210	11.7	229,080
1954...	43,139,998	84.2	1,158,365	1,637,535	3.2	15,725	5,991,586	11.7	128,376
1955...	44,408,690	84.5	1,268,692	1,648,398	3.1	10,863	6,042,309	11.5	50,723
1956...	45,711,460	84.7	1,302,770	1,686,555	3.1	38,157	6,124,745	11.3	82,436
1957...	46,857,066	84.9	1,145,606	1,635,227	3.0	−51,328	6,186,701	11.2	61,956
1958...	47,788,587	85.0	931,521	1,634,348	2.9	−879	6,281,076	11.2	94,375
1959‡..	48,940,000	85.1	1,151,413	1,660,000	2.9	25,652	6,360,000	11.1	78,924

Source: Edison Electric Institute. * Customers served under distinctly rural rates. ‡ Estimated.

REVENUE

$816 Million Boost Shoves

(Thousands of Dollars)

	Residential			Rural*			Small Light & Power		
	Revenue	% Total	% Change	Revenue	% Total	% Change	Revenue	% Total	% Change
1943...	1,029,260	33.4	3.9%	76,617	2.5	2.1%	773,678	25.2	0.8%
1944...	1,097,726	33.5	6.7%	82,842	2.5	8.1%	817,355	24.9	5.6%
1945...	1,167,356	34.9	6.3%	90,345	2.7	9.1%	850,213	25.4	4.0%
1946...	1,240,577	35.9	6.3%	104,876	3.0	16.1%	924,775	26.7	8.8%
1947...	1,366,498	35.5	10.2%	123,749	3.2	18.0%	1,031,335	26.8	11.5%
1948...	1,532,664	35.5	12.2%	140,648	3.3	13.7%	1,152,783	26.7	11.8%
1949...	1,716,533	37.2	12.0%	160,855	3.5	14.4%	1,228,726	26.6	6.6%
1950...	1,931,696	38.0	12.5%	157,611	3.1	2.0%	1,333,755	26.2	8.5%
1951...	2,165,010	38.3	12.1%	175,431	3.1	11.3%	1,462,262	25.9	9.6%
1952...	2,400,889	39.1	10.9%	184,479	3.0	5.2%	1,584,219	25.8	8.3%
1953...	2,659,303	39.1	10.7%	201,691	3.0	9.3%	1,747,572	25.7	10.3%
1954...	2,920,196	40.1	9.8%	216,391	3.0	7.3%	1,846,634	25.4	5.7%
1955...	3,186,651	39.7	9.1%	228,815	2.9	5.7%	1,993,099	24.9	7.9%
1956...	3,476,719	40.0	9.1%	240,353	2.8	5.0%	2,147,085	24.7	7.7%
1957...	3,759,110	40.5	8.1%	242,457	2.6	0.9%	2,303,802	24.8	7.3%
1958...	4,024,840	41.3	7.1%	251,185	2.6	3.6%	2,439,984	25.1	5.9%
1959‡..	4,325,000	41.0	7.5%	275,000	2.6	9.5%	2,665,000	25.3	9.2%

Source: Edison Electric Institute. * Revenue from sales under distinctly rural rates. ‡ Estimated.

Total Electric Customers to 57.5 Million

	Large Light & Power			Other Classifications			Total	
	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	Annual Change
1943	146,593	0.5	−3,335	120,125	0.4	−4,962	32,396,300	185,860
1944	151,652	0.4	5,059	117,844	0.4	−2,281	33,048,392	652,092
1945	162,338	0.5	10,686	119,112	0.4	1,268	34,031,073	982,681
1946	174,662	0.5	12,324	122,381	0.3	3,269	36,140,291	2,109,218
1947	191,363	0.5	16,701	135,597	0.4	13,216	38,431,950	2,291,659
1948	204,230	0.5	12,867	142,053	0.3	6,456	40,721,988	2,290,038
1949	232,125	0.5	27,895	148,107	0.3	6,054	42,850,781	2,128,793
1950	234,728	0.5	2,603	156,690	0.3	8,583	44,986,294	2,135,513
1951	247,532	0.5	12,804	162,881	0.3	6,191	46,821,879	1,835,585
1952	256,294	0.5	8,762	158,228	0.3	−4,653	48,450,571	1,628,692
1953	271,947	0.5	15,653	160,465	0.3	2,237	49,899,065	1,448,494
1954	280,819	0.5	8,872	164,621	0.3	4,156	51,214,559	1,315,494
1955	287,788	0.5	6,969	171,416	0.3	6,795	52,558,601	1,344,042
1956	295,518	0.5	7,730	176,615	0.3	5,199	53,994,893	1,436,292
1957	308,751	0.6	13,233	183,344	0.3	6,729	55,171,089	1,176,196
1958	315,410	0.6	6,659	189,070	0.3	5,726	56,208,491	1,037,402
1959‡	323,000	0.6	7,590	197,000	0.3	7,930	57,480,000	1,271,509

Industry Revenues Up 8.4% to $10.6 Billion

(Thousands of Dollars)

	Large Light & Power			Other Classifications			Total	
	Revenue	% Total	% Change	Revenue	% Total	% Change	Revenue	% Change
1943	964,192	31.3	16.4%	233,896	7.6	19.9%	3,077,643	7.8%
1944	1,043,392	31.8	8.2%	235,436	7.2	6.2%	3,276,751	6.5%
1945	1,001,957	30.0	4.0%	231,647	6.9	−1.6%	3,341,518	2.0%
1946	969,349	28.0	−3.3%	219,983	6.4	−5.0%	3,459,560	3.5%
1947	1,106,555	28.7	14.1%	224,628	5.8	2.1%	3,852,765	11.4%
1948	1,250,684	29.0	13.0%	236,534	5.5	5.3%	4,313,313	12.0%
1949	1,262,698	27.4	1.0%	245,257	5.3	3.7%	4,614,069	7.0%
1950	1,404,980	27.6	11.3%	258,423	5.1	5.4%	5,086,465	10.2%
1951	1,571,932	27.8	11.9%	273,037	4.8	5.7%	5,647,672	11.0%
1952	1,684,073	27.4	7.1%	283,612	4.6	3.9%	6,137,272	8.7%
1953	1,883,640	27.7	11.9%	301,454	4.4	6.3%	6,793,660	10.7%
1954	1,977,283	27.2	5.0%	316,763	4.4	5.1%	7,277,267	7.1%
1955	2,275,727	28.4	15.1%	336,147	4.2	6.1%	8,020,439	10.2%
1956	2,475,476	28.5	8.8%	358,675	4.1	6.7%	8,698,308	8.5%
1957	2,598,933	28.0	5.0%	385,300	4.1	7.4%	9,289,602	6.8%
1958	2,603,641	26.7	0.2%	414,156	4.3	7.5%	9,733,806	4.8%
1959‡	2,840,000	26.9	9.1%	445,000	4.2	7.4%	10,550,000	8.4%

PRODUCTION

Source and Disposal of Energy—Millions of Kwhr

	Production		Total Production	Add Net Imports	Less Energy Used by Producer	Total for Distribution	Losses	Sales to Ultimate Consumers
	Fuel	Hydro						
1943	144,127	73,632	217,759	1,537	8,729	210,567	24,678	185,889
1944	154,244	73,945	228,189	1,597	6,541	223,245	25,084	198,161
1945	142,516	79,970	222,486	1,773	3,368	220,891	27,333	193,558
1946	144,772	78,406	223,178	1,666	4,576	220,268	29,474	190,794
1947	177,313	78,426	255,739	1,269	6,186	250,822	33,241	217,581
1948	200,228	82,470	282,698	1,113	6,368	277,443	36,703	240,740
1949	201,351	89,748	291,100	1,004	5,887	286,217	37,675	248,542
1950	233,203	95,938	329,141	1,283	8,445	321,979	41,440	280,539
1951	270,922	99,751	370,673	1,721	9,356	363,038	44,870	318,168
1952	294,121	105,102	399,224	1,758	10,731	390,251	47,727	342,524
1953	337,432	105,233	442,665	1,365	9,398	434,632	50,388	384,244
1954	364,617	107,069	471,686	1,688	10,864	462,510	51,606	410,904
1955	434,063	112,975	547,038	3,310	13,908	536,440	55,519	480,921
1956	478,639	122,029	600,668	4,548	16,613	588,603	58,475	530,128
1957	501,275	130,232	631,507	3,601	18,293	616,815	58,986	557,829
1958	504,836	140,262	645,098	3,340	18,043	630,395	61,234	569,161
1959*	571,993	137,707	709,700	3,525	20,175	693,050	66,500	626,550

Source: Federal Power Commission and Edison Electric Institute. All data revised to correspond with current basis which excludes former Mining and Manufacturing and Railroad classification. * Estimated.

INSTALLED CAPACITY

Installed Capacity by Type of Prime Mover—Mw

	Fuel			Hydro			Total	
	Capacity	% Total	Annual Change	Capacity	% Total	Annual Change	Capacity	Annual Change
1943	34,068	71.0	1,857	13,883	29.0	1,041	47,951	2,898 (6.4%)
1944	34,603	70.3	535	14,586	29.7	703	49,189	1,238 (2.6%)
1945	35,199	70.2	596	14,912	29.8	326	50,111	922 (1.9%)
1946	35,468	70.5	269	14,849	29.5	−63	50,317	206 (0.4%)
1947	37,351	71.4	1,883	14,971	28.6	122	52,322	2,005 (4.0%)
1948	40,908	72.3	3,557	15,652	27.7	681	56,560	4,238 (8.1%)
1949	46,446	73.6	5,538	16,654	26.4	1,002	63,100	6,540 (11.6%)
1950	51,244	74.4	4,798	17,675	25.6	1,021	68,919	5,819 (9.2%)
1951	56,907	75.1	5,663	18,868	24.9	1,193	75,775	6,856 (9.9%)
1952	61,807	75.1	4,900	20,419	24.9	1,551	82,226	6,451 (8.5%)
1953	69,457	75.9	7,650	22,045	24.1	1,626	91,502	9,276 (11.3%)
1954	79,382	77.4	9,925	23,211	22.6	1,166	102,592	11,090 (12.1%)
1955	89,468	78.2	10,086	25,004	21.8	1,793	114,472	11,880 (11.6%)
1956	95,043	78.7	5,575	25,654	21.3	650	120,697	6,225 (5.4%)
1957	102,087	79.1	7,044	27,036	20.9	1,382	129,123	8,426 (7.0%)
1958	113,237	79.4	11,150	29,359	20.6	2,323	142,596	13,473 (10.4%)
1959*	125,645	80.2	12,408	30,977	19.8	1,618	156,622	14,026 (9.8%)

Source: Federal Power Commission. * Preliminary.

Production of Electric Energy by Ownership—Millions of Kwhr

	Power Companies		Federal Agencies		Municipal, State & Power District Systems		Cooperatives	
	Production	% Total	Production	% Total	Production	% Total	Production	% Total
1943	180,248	82.8	24,484	11.2	13,027†	6.0	.....	...
1944	185,850	81.4	28,866	12.7	13,473†	5.9	.....	...
1945	180,926	81.3	28,000	12.6	13,560†	6.1	.....	...
1946	181,020	81.1	26,960	12.1	15,198†	6.8	.....	...
1947	208,106	81.4	29,877	11.7	17,352	6.9	404	0.2
1948	228,231	80.7	35,373	12.5	18,444	6.5	650	0.2
1949	233,112	80.1	38,102	13.1	19,122	6.6	764	0.3
1950	266,860	81.1	40,387	12.3	20,908	6.4	986	0.3
1951	301,845	81.4	44,120	11.9	23,444	6.3	1,264	0.3
1952	322,126	80.7	52,492	13.2	23,080	5.8	1,526	0.4
1953	354,271	80.0	58,064	13.1	28,433	6.4	1,896	0.4
1954	370,970	78.6	67,804	14.4	30,436	6.5	2,476	0.5
1955	420,869	76.9	89,064	16.3	34,061	6.2	3,044	0.6
1956	459,015	76.4	100,711	16.8	37,529	6.2	3,413	0.6
1957	480,943	76.2	109,176	17.3	38,358	6.1	3,030	0.5
1958	490,402	76.0	110,437	17.1	40,835	6.3	3,424	0.5
1959*	544,024	76.7	109,062	15.4	52,000	7.3	4,614‡	0.7

Source: Federal Power Commission. † Includes Cooperatives. ‡ Estimated by Electrical World.

Generating Capacity by Ownership—Mw

	Power Companies		Federal		Municipal, State & Power District Systems		Cooperatives	
	Capacity	% Total	Capacity	% Total	Capacity	% Total	Capacity	% Total
1943	39,128	81.6	4,322	9.0	4,501†	9.4	...	...
1944	39,733	80.8	4,886	9.9	4,570†	9.3	...	...
1945	40,307	80.4	5,081	10.2	4,723†	9.4	...	...
1946	40,335	80.2	4,920	9.8	5,062†	10.0	...	...
1947	41,987	80.2	5,027	9.6	5,141	9.9	167	0.3
1948	45,381	80.2	5,526	9.8	5,453	9.6	200	0.4
1949	50,484	80.0	6,210	9.8	6,168	9.8	238	0.4
1950	55,175	80.1	6,921	10.0	6,511	9.4	312	0.5
1951	60,192	79.4	8,099	10.7	6,993	9.2	491	0.6
1952	64,349	78.4	9,678	11.8	7,667	9.3	532	0.6
1953	71,201	77.8	11,358	12.4	8,343	9.1	600	0.7
1954	79,127	77.1	13,567	13.2	9,130	8.9	768	0.7
1955	86,887	75.9	16,962	14.8	9,823	8.6	800	0.7
1956	91,145	75.5	18,336	15.2	10,421	8.6	795	0.7
1957	97,376	75.4	19,649	15.2	11,177	8.7	920	0.7
1958	108,202	75.9	20,436	14.3	12,982	9.1	977	0.7
1959*	118,870	75.9	21,874	14.0	14,764	9.4	1,114‡	0.7

Source: Federal Power Commission. † Includes Cooperatives. * Preliminary. ‡ Estimated by Electrical World.

ELECTRICAL MANUFACTURING

Electrical Product Shipments

Manufacturer's shipments of electrical products hit $21.5 billion in 1959, 11.2% over the $19.4 billion shipped in 1958. Present NEMA forecasts expect a 7.2% gain during 1960.

Consumer products helped spark the upturn by posting an 11.5% increase to hit $6 billion—about 28% of total electrical shipments. For details of individual appliance performance see page 84.

However, gains were made by all product groups in '59 with the top performers acting as follows: Insulating

The definitions of electric products included in the following groups has been changed as of December 1959. Therefore data previously released are not comparable cautions the National Electrical Manufacturers Association. However, the following data for 1958, 1959 and 1960 are comparable.

Non-Electrical Products (including non-electrical defense and war material) manufactured within the industry, have been excluded from these data.

Note: Products in italics are additions to the eight product groupings previously used.

Total Shipments of Electrical Products ($ Millions)

1958	$19,352.0
1959*	$21,513.5
1960†	$23,058.4

*Preliminary †NEMA Forecast

Data shown in tabulation are based upon total industry shipments including exports and interplant transfers of electrical products which are considered to cover not only those products included in the Electrical Machinery Group, as defined by the U.S. Census of Manufacturers, but also lighting fixtures, steam engines and turbines, household and commercial refrigeration machinery, air conditioning machinery, household laundry equipment, vacuum cleaners and electrical insulating materials such as porcelain, mica, laminated products, vulcanized fibre, varnished fabric and paper.

Consumer Products ($ Millions)

1958	$5,406.1
1959	$6,029.8
1960	$6,301.1

This includes electric household refrigerators, electric farm and home freezers, electric ranges, electric water heaters, electric housewares, electric fans, electric commercial cooking equipment, electric dehumidifiers, electric household food waste disposers, and dishwashers, packaged room air conditioners, electric dryers, electric ironers, electric washing machines, vacuum cleaners, radio and television receiving sets, *house heating equipment, phonograph records and needles, radio receiving tubes, commercial air conditioning and commercial refrigeration,* compressors and condensing units and parts and accessories for electrical appliances.

Lighting Equipment ($ Millions)

1958	$1,313.7
1959	$1,442.1
1960	$1,538.8

This includes industrial, commercial and residential lighting equipment, aviation ground lighting, floodlighting and street lighting equipment, vehicular, railway and other lighting equipment, portable lamps, *ballasts, electric lamps and lamp components.*

Industrial Electronics & Communications Equipment ($ Millions)

1958	$5,266.0
1959	$5,843.6
1960	$6,332.8

This includes telephone equipment, signalling apparatus, X-Ray apparatus and tubes, power rectifier equipment, power semi-conductor components, other rectifying apparatus, electrical indicating instruments, electron tubes and parts, cathode ray tubes, batteries, induction and dielectric heating apparatus, electrical hearing aids, commercial radio and TV communications, radio and electronic navigation aids etc., electronic type components for communications and industrial electronic controls, recorders, amplifiers, audio equipment etc, electric railway signals and attachments.

Post 11.2% Gain—Hit $21.5 Billion

materials up 27.4% to $404 million; industrial equipment up 15.2% to $3.5 billion; insulated wire and cable up 15% to $1.5 billion; industrial electronics and communications equipment up 11% to $5.8 billion; lighting equipment up 9.8% to $1.4 billion; and building equipment up 8.8% to $749 million.

Generation, transmission and distribution equipment inched up 1.6% to $2,079 million. Undoubtedly this reflects a drop in shipments of generating equipment and sharp discounting which plagued some products.

Industrial Equipment ($ Millions)

1958	$3,006.8
1959	$3,462.8
1960	$3,750.8

This includes carbon products, commutators, welding wire, welding machines, resistance welders, industrial heating units and devices, industrial controls, mining belt conveyors, motors and generators, *large generating and converting apparatus,* mining and industrial electric locomotives, renewal parts, manufactured graphite, precision snap-acting switches, *electrical contacts, industrial automatic systems, automatic temperature controls, adsorption, time switches, land transportation and motor controls.*

Building Equipment ($ Millions)

1958	$688.0
1959	$748.5
1960	$797.2

This includes conduit fittings, metallic and plastic outlet and switch boxes, rigid steel conduit and electrical metallic tubing and fittings, wiring devices, molded case breakers, busways, fuses, switch and enclosed breakers, panelboards and distribution boards, bituminous conduit, and *steel underfloor raceways.*

Insulating Materials ($ Millions)

1958	$316.9
1959	$403.7
1960	$441.4

This includes steatite electrical products, laminated products, manufactured electrical mica, varnished fabric and paper, varnished tubing and saturated sleeving, and vulcanized fibre, electrical glass insulation, and combed flexible electrical insulation.

Insulated Wire and Cable ($ Millions)

1958	$1,307.5
1959	$1,503.6
1960	$1,654.0

This includes armored cable, rubber and thermoplastic power and control cable, high temperature insulated wire, flexible cords and cord sets, fixtures and appliance wire, magnet wire, paper power cable, building wire and cable, portable molded rubber sheathed cord and cable, varnished cambric cable, weatherproof and slow-burning wire, communication and signal wire and cable, automotive, aircraft and marine wire and cable, and non-metallic sheathed cable.

Generation, Transmission, & Distribution Equipment ($ Millions)

1958	$2,047.0
1959	$2,079.4
1960	$2,242.3

This includes power and specialty capacitors, electric measuring and test equipment, transmission and distribution voltage regulators, hydraulic turbines, high voltage insulators, lightning protective devices, dry process electrical porcelain, overhead trolley line materials, switchgear, power and distribution transformers, steam and gas turbines, pole line hardware, rail bonds, transmission hardware, and other related products.

Appliance Sales Shot Up 15% to $8.5 Billion in '59

Index of Saturation

JANUARY 1, 1960

	Number and Percentage of Wired Homes With	
Air Conditioners (room)	6,500,000	12.8%
Bed Coverings	10,800,000	21.3
Blenders	3,800,000	7.5
Clocks*	40,268,000	79.6
Coffee Makers (automatic)	27,000,000	53.4
Dehumidifiers	1,325,000	2.6
Dishwashers	3,200,000	6.3
Dryers, Clothes (elec & gas)	9,010,000	17.8
Food Waste Disposers	4,800,000	9.5
Freezers	11,200,000	22.1
Frypan-Skillets	20,600,000	40.7
Heaters, Portable (elec)	14,415,000	28.5
Heating Pads	19,925,000	39.4
Hotplates	12,105,000	23.9
Ironers	4,365,000	8.6
Irons (standard)	44,850,000	88.6
Steam Irons	28,200,000	55.7
Mixers	27,000,000	53.4
Phonographs	32,500,000	64.2
Radio**	49,950,000	96.1
Ranges (standard)	14,500,000	28.7
Ranges (built-in)	2,700,000	5.3
Refrigerators	49,605,000	98.0
Sandwich-Wafflers (comb)	17,615,000	34.8
Shavers	34,500,000	68.2
Television**	45,500,000	89.9
Toasters	40,195,000	79.4
Vacuum Cleaners	36,700,000	72.5
Washers, Electric	47,100,000	93.1
Water Heaters	9,400,000	18.6

* Adjusted Jan. 1958 ** NBC — ARF — NAB — Nielsen
Source: *Electrical Merchandising Week*

The appliance-TV industry made a spectacular comeback in 1959 by racking up a 15% gain in retail sales. This put the year's volume at $8.5 billion compared with $7.4 billion in 1958 and $8.4 billion in 1956 according to data compiled by Electrical Merchandising Week, another McGraw-Hill publication. Had the 4-month-long steel strike not taken place, says EMW, the gain most likely would have been greater. But rising unemployment and steel shortages of some appliance manufacturers tended to dampen sales towards year end.

However, adds EMW, these postponed sales should help boost 1960 sales another 5.9%.

Sales gains last year were pretty much across-the-board with relatively few items such as fryers, frypans, and hotplates losing ground from the previous year. The one notable minus sign was chalked up by electric water heaters which dropped 10.2% in unit sales. This is in contrast with gas water heaters which racked up a 12.8% gain.

All other major appliances made respectable gains this past year. Electric ranges were standout performers gaining 24% in unit volume to a total of 1.7 million units. However, even more interesting is the gain of 37.9% by built-in units compared with a 14.8% gain by standard electric ranges.

Refrigerator sales hit 1.26 million units—20.3% over 1958 despite a high index of saturation (98%) and black and white television chalked up a 27.4% gain in the face of 89.9% saturation. This put 1959 retail TV sales at 1.34 million units.

Other old standbys such as automatic and non-automatic washing machines chalked up gains of 6.5% and 6.1% respectively and washer-dryer combinations unit sales were up 17.6%.

Room air conditioners sales jumped 7.6% to 1.8 million units reflecting the hot weather that hit most parts of the country this past summer. However, even with this increase the room air conditioner saturation index only hit 12.8%.

Still other appliances with low saturation chalked up respectable gains. Dishwashers with 6.3% saturation were up 23.5% to 525 thousand units, dehumidifiers with 2.6% saturation were up 21.4% to 255 thousand units and home freezers with 22.1% saturation were up 9.0% to 1.2 million units.

Clothes dryers with only 17.8% saturation jumped 14.9% last year to 1.4 million units. Although, here again, gas made a better showing than electricity. While electric dryer sales bounced up 10.9% to 935 thousand units, gas units skyrocketed 23.4% to 490 thousand units.

However, another interesting development from the electric utility standpoint was the 10.9% increase racked up by unit sales of electric heaters, particularly wall type and baseboard heaters, which increased 23.1% to 825 thousand units.

Retail Appliance - TV Sales

	1958		1959		1959 vs 1958	
	Units (Thousands)	Retail Value (Thousands)	Units (Thousands)	Retail Value (Thousands)	Units % Change	Retail Value % Change
Air Conditioners, Room	1,673	$466,767	1,800	484,200	7.6	3.7
Bed Coverings, Electric	2,475	61,750	3,300	75,735	33.3	22.6
Blenders	430	15,888	455	16,357	5.8	3.0
Cleaners, Vacuum Floor	3,295	291,937	3,425	314,244	3.9	7.6
Clocks	7,800	55,000	8,100	57,000	3.8	3.6
Coffee Makers, Automatic	4,250	80,535	4,750	94,762	11.8	17.7
Dehumidifiers	210	22,050	255	27,285	21.4	23.7
Dishwashers, Motor Driven	425	116,792	525	136,500	23.5	16.9
Dryers, Clothes, Total	1,240	280,495	1,425	320,585	14.9	14.3
Electric	843	181,245	935	201,025	10.9	10.9
Gas	397	99,250	490	119,560	23.4	20.5
Food Waste Disposers	617	55,454	785	62,761	27.2	13.2
Freezers, Home	1,101	385,315	1,200	406,800	9.0	5.6
Fryers, Deep Fat	440	7,018	345	5,848	−21.6	−16.7
Frypan—Skillets	3,750	71,062	3,390	60,850	− 9.6	−14.4
Heaters, Convector & Radiant, Total	1,965	57,710	2,180	67,375	10.9	16.7
Fan Forced & Fan-Htr. Portables	1,025	22,500	1,125	25,312	9.8	12.5
Non-Fan Forced Portable	270	6,400	230	4,525	−14.8	−29.3
Wall Type & Baseboard	670	28,810	825	37,538	23.1	30.3
Heating Pads	1,995	12,468	2,560	15,232	28.3	22.2
Hotplates	610	4,850	585	4,651	− 4.1	− 4.1
Ironers	35	7,525	40	8,600	14.3	14.3
Irons, Automatic	1,225	12,189	1,550	15,422	26.5	26.5
Irons, Steam	4,100	73,595	4,360	76,954	6.3	4.6
Mixers, Food—Standard	770	30,415	925	34,687	20.1	14.0
Portable	1,995	36,907	2,250	41,625	12.8	12.8
Ranges, Total Electric	1,355	360,095	1,680	460,800	24.0	28.0
Standard	810	206,575	930	241,800	14.8	17.1
Built-In	544	153,520	750	219,000	37.9	42.7
Refrigerators	3,117	997,344	3,750	1,260,000	20.3	26.3
Television, B & W	4,920	1,008,600	6,270	1,335,510	27.4	32.4
Toasters, Automatic & Non-Auto	3,300	59,395	3,744	67,432	13.5	13.5
Washing Machines—Automatic	2,832	792,960	3,015	844,200	6.5	6.5
Non-Automatic	938	145,390	995	156,215	6.1	7.4
Washer-Dryer Combinations	170	82,450	200	95,000	17.6	15.2
Water Heaters, Electric	824	86,475	740	80,505	−10.2	− 6.9
Gas	2,673	240,570	3,016	271,440	12.8	12.8

Source: *Electrical Merchandising Week*

Replacements and Trade-ins as a Percent of Total Sales

	1959		1958		1957		1956		1955		1954	
	Trade-ins	Replacements	Trade-ins	Replacements	Trade-ins	Replacements	Trade-ins	Replacements	Trade-ins	Replacements	Trade-ins	Replacements
Refrigerators	45.3	78.5	52.9	77.2	46.8	79.2	54.2	77.4	45.3	72.1	49.0	69.9
Freezers	7.3	13.5	7.7	14.9	9.5	15.4	7.1	14.1	6.7	12.6	5.5	9.0
Room Air Conditioners	4.3	13.9	2.5	11.6	1.3	5.9	1.8	3.9	0.9	2.4	0.5	2.0
Ranges	42.2	64.7	38.6	61.6	42.6	62.2	42.7	59.7	35.1	63.6	40.8	53.3
Water Heaters	10.9	55.0	7.4	50.4	10.5	44.7	12.2	43.6	7.5	51.1	10.2	49.3
Washers	47.7	69.8	50.2	73.3	50.4	74.1	54.8	76.8	47.7	71.3	49.0	67.0
Clothes Dryers	8.2	22.2	6.6	18.9	7.0	13.6	6.0	12.5	4.4	8.3	3.1	12.9
Vacuum Cleaners	19.1	67.3	14.7	63.4	15.7	62.3	31.9	59.7	27.7	64.1	23.7	58.9
Dishwashers	2.5	12.9	2.2	9.6	3.0	17.9	2.8	7.4	2.5	5.9	1.2	5.0
Disposers	5.4	18.0	2.6	11.8	....	....	....	....	....	....	....	....
Television	46.3	70.3	45.6	65.2	36.8	59.4	36.6	52.2	24.5	38.8	22.7	40.3

Source: *Electrical Merchandising Week*

Co-ops Up Revenue 9.8% On Sales Gain Of 15.3%

Energy sales by REA-financed power systems hit a record 25.3 billion kwhr in 1959 for a whopping 15.3% gain over 1958's 21.9 billion kwhr. This boosted operating revenues 9.8% from $563 million in 1958 to $618 million in 1959.

Cost of energy input for all borrowers fell 2.9% to 6.8 mills per kwhr and revenue per kwhr fell 5.1% to 2.05¢ in 1959.

Average annual use by REA residential customers (including farm and non-farm) jumped 384 kwhr from 3,732 in 1958 to 4,116 in 1959. This bettered an industry-wide gain of 211 kwhr by 82%.

Average revenue from residential customers registered a 4.9% drop during 1959 ending up at 2.52¢ per kwhr. However, increased usage boosted the REA customer's average annual bill to $103.68 in 1959 vs $98.76 in 1958.

Statistics of REA-Financed Systems

	1957	1958	1959[1]
CUMULATIVE YEAR-END DATA			
Total Loans Approved	$3,633,663,287	$3,846,620,615	$4,010,696,418
Distribution Lines	2,821,177,793	2,938,385,204	3,058,674,406
Generation and Transmission	776,505,160	868,542,478	910,326,377
Consumer Facilities	35,980,334	39,692,933	41,695,635
Funds Advanced	3,051,554,838	3,254,776,704	3,469,649,317
Systems in Operation	1,030	1,030	1,032
Miles of Line in Operation	1,405,327	1,424,441	1,445,000
Consumers Served	4,466,444	4,596,270	4,736,000
Systems Generating Power During Year	76	76	75
Generating Plants—Kw Capacity (Active Only)	1,013,115	1,098,418	1,385,000
ANNUAL DATA			
Energy Generated—Kwhr	3,291,162,000	3,482,173,000	4,933,000,000
Energy Purchased—Kwhr[2]	19,266,304,000	21,500,345,000	24,198,000,000
Total System Input—Kwhr[2]	22,557,466,000	24,982,518,000	29,131,000,000
Energy Sold—Kwhr[2]	19,676,628,000	21,901,769,000	25,256,000,000
Operating Revenues[3]	$523,783,014	$563,204,367	$618,300,000
Operating Deductions Total	417,484,513	450,522,702	495,100,000
Cost of Power[4]	186,005,134	202,692,968	228,400,000
Distribution Expenses—Operations	37,498,905	39,734,778	41,800,000
Distribution Expenses—Maintenance	18,918,397	19,598,409	20,700,000
Consumers Accounting & Collecting	17,784,362	19,231,124	20,500,000
Admin. & General Expenses	43,739,855	47,851,853	53,900,000
Electric Sales Promotion Expenses	7,449,315	8,770,156	10,300,000
Depreciation	89,573,459	94,529,624	99,300,000
Amortization of Intangibles	1,259,159	1,457,800	1,200,000
Taxes	15,255,927	16,655,990	19,000,000
Utility Operating Margin	106,298,501	112,681,665	123,200,000
Non-Operating Margin	7,937,080	9,580,454	12,300,000
Interest on Long Term Debt	45,283,356	46,814,538	47,900,000
Interest Charged to Construction Cr	458,929	354,939	900,000
Other Deductions	510,763	581,980	800,000
Net Margin	68,900,391	75,220,540	87,700,000
PAYMENTS TO GOVERNMENT—CUMULATIVE DATA			
Interest Due	$306,600,910	$350,287,796	$397,075,923
Interest Paid	306,535,317	350,163,823	397,017,809
Principal Due	503,361,117	582,725,559	666,233,373
Principal Paid[5]	624,291,276	725,414,255	823,244,488
Overdue Amounts—More than 30 days	123,206	137,553	97,582
a. Interest	21,032	33,336	27,795
b. Principal	102,174	104,217	69,787
Advance Payments[6]	117,483,376	138,972,625	154,020,026

Source: Monthly Operating Reports of Rural Electrification Administration borrowers and records of Rural Electrification Administration.

[1] Operating and financial statistics of borrowers are based on nine months actual data.

[2] Excludes energy sales between REA borrowers.

[3] Includes revenues from sales of power between REA borrowers.

[4] Cost of Power includes cost of purchased power and prime costs involved in the production and transmission of generated energy.

[5] Advance payments are included in Principal Paid.

Coal Rate Drops to 0.89 lb Per Kwhr

Improved efficiency of fuel burning generating plants dropped the coal rate to 0.89 lbs per kwhr in 1959—a decline of 1.1%.

Of total energy produced thermally in 1959, coal represented 66.1% or 378.3 billion kwhr—9.8% more than in 1958. This boosted coal consumption 8.2%.

Gas accounted for 25.6% of thermally produced energy last year compared with 23.7% in 1958 boosting production by this fuel 22.2% to 146.4 billion kwhr.

Oil-produced energy hit 46.9 billion kwhr in 1959, or 8.2% of the total, for an increase of 16.1%. Oil consumption during '59 jumped 13.8% to 88.4 million barrels.

Use of hydro capacity fell from 4,974 hours in 1958 to 4,565 hours in 1959 while fuel-plant use picked up to 4,789 hours compared with 4,689 hours in 1958.

Production, Capacity, Average Use

	Production Millions of Kwhr			Year End Capacity Thousands of Kw			Kwhr per Kw of Average Capacity		
	Fuel	Hydro	Total	Fuel	Hydro	Total	Fuel	Hydro	Total
1947	177,313	78,426	**255,739**	37,351	14,971	**52,322**	4,870	5,260	**4,983**
1948	200,228	82,470	**282,698**	40,908	15,652	**56,560**	5,052	5,386	**5,193**
1949	201,352	89,748	**291,100**	46,446	16,654	**63,100**	4,610	5,561	**4,865**
1950	233,203	95,938	**329,141**	51,244	17,675	**68,919**	4,774	5,589	**4,986**
1951	270,922	99,751	**370,673**	56,907	18,868	**75,775**	5,010	5,460	**5,123**
1952	294,121	105,103	**399,224**	61,807	20,419	**82,226**	4,955	5,350	**5,054**
1953	337,432	105,233	**442,665**	69,457	22,045	**91,502**	5,141	4,957	**5,096**
1954	364,617	107,069	**471,686**	79,381	23,211	**102,592**	4,899	4,732	**4,860**
1955	434,063	112,975	**547,038**	89,468	25,004	**114,472**	5,141	4,686	**5,040**
1956	478,639	122,029	**600,668**	95,043	25,654	**120,697**	5,188	4,818	**5,108**
1957	501,275	130,232	**631,507**	102,087	27,036	**129,123**	5,086	4,943	**5,056**
1958	504,836	140,262	**645,098**	113,237	29,359	**142,596**	4,689	4,974	**4,748**
1959*	571,993	137,707	**709,700**	125,645	30,977	**156,622**	4,789	4,565	**4,744**

Source: Federal Power Commission. * Preliminary. 1945 and after excludes former Mining and Manufacturing and Railroad and Railway classifications

Consumption of Coal, Oil and Gas

	Energy Generated From Coal, Oil, and Gas				Coal, Oil, and Gas Consumed				Coal Rate
	Coal Billions of Kwhr	Oil Billions of Kwhr	Gas Billions of Kwhr	Total Billions of Kwhr	Coal Millions of Tons	Oil Millions of Bbls	Gas Billions of Cu Ft	Coal and Equivalent of Oil and Gas Millions of Tons	Pounds per Kwhr
1947	137.0	16.9	23.1	177.0	89.53	45.31	373.05	115.67	1.31
1948	152.9	16.8	30.1	199.8	99.59	42.64	478.10	130.12	1.30
1949	135.5	28.5	37.0	201.0	83.96	66.30	550.12	124.57	1.24
1950	154.5	33.7	44.6	232.8	91.87	75.42	628.92	138.42	1.19
1951	185.2	28.7	56.6	270.5	105.77	63.94	763.90	154.50	1.14
1952	195.4	29.7	68.5	293.6	107.07	67.22	910.12	160.87	1.10
1953	218.9	38.4	79.8	337.1	115.90	82.24	1,034.27	178.49	1.06
1954	239.1	31.5	93.7	364.3	118.38	66.74	1,165.50	180.37	0.99
1955	301.4	37.1	95.3	433.8	143.76	75.27	1,153.28	206.93	0.95
1956	338.5	36.0	104.0	478.5	158.28	72.71	1,239.31	223.73	0.94
1957	346.4	40.5	114.2	501.1	160.77	79.69	1,336.14	232.58	0.93
1958	344.4	40.4	119.8	504.6	155.72	77.67	1,372.85	228.14	0.90
1959*	378.3	46.9	146.4	572.0†	168.43	88.35	1,627.08	254.56	0.89

Source: Federal Power Commission. * Preliminary. † Small amount of energy generated from wood, waste and nuclear fuel included in total

Changes in Installed Generating Capacity—Mw (Nameplate)

	New Additions	Retirements	Adjustments * Plus	Adjustments * Minus	Net Additions
1951					
Hydro	1,187	13	28	9	1,193
Steam	5,670	176	124	85	5,533
Internal Combustion	111	29	66	18	130
Total	**6,968**	**218**	**218**	**112**	**6,856**
1952					
Hydro	1,460	14	116	11	1,551
Steam	4,892	142	316	252	4,814
Internal Combustion	105	43	45	21	86
Total	**6,457**	**199**	**477**	**284**	**6,451**
1953					
Hydro	1,632	21	24	9	1,626
Steam	7,803	221	129	155	7,556
Internal Combustion	86	34	46	4	94
Total	**9,521**	**276**	**199**	**168**	**9,276**
1954					
Hydro	1,148	19	67	30	1,166
Steam	10,287	450	211	181	9,867
Internal Combustion	97	39	38	39	57
Total	**11,532**	**508**	**316**	**250**	**11,090**
1955					
Hydro	1,500	24	331	13	1,794
Steam	10,383	587	353	139	10,010
Internal Combustion	87	47	44	8	76
Total	**11,970**	**658**	**728**	**160**	**11,880**
1956					
Hydro	918	253	...	103	562
Steam	5,288	276	356	17	5,351
Internal Combustion	69	22	9	6	50
Total	**6,275**	**551**	**365**	**126**	**5,963**
1957					
Hydro	1,294	13	105	4	1,382
Steam	6,648	301	652	48	6,951
Internal Combustion	97	31	32	5	93
Total	**8,039**	**345**	**789**	**57**	**8,426**
1958					
Hydro	2,353	10	9	25	2,327
Steam	10,818	449	555	31	10,893
Internal Combustion	75	35	32	2	70
Total	**13,246**	**494**	**596**	**58**	**13,290**
1959†					
Hydro	1,681	69	7	1	1,618
Steam	11,823	438	997	23	12,359
Internal Combustion	78	45	18	3	48
Total	**13,582**	**552**	**1,022**	**27**	**14,025**

Source: Edison Electric Institute and Federal Power Commission. † Preliminary. * Adjustments are result of reclassification in ownership between industrial and electric utility plants and rerating of turbines within the electric utility industry.

Number & Installed Capacity of Electric Utility Generating Plants by States & Type of Prime Mover—Kw

December 31, 1959 (Preliminary)

	Number of Utilities [a]	Number of Plants [b]	Total Capacity (Kilowatts)	Hydro		Steam		Internal Combustion	
				Number	Capacity	Number	Capacity	Number	Capacity
UNITED STATES	1,315	3,468	156,622,092	1,355	30,977,108	1,053	122,981,598	1,060	2,663,386
New England	82	299	6,673,392	191	1,256,688	72	5,300,744	36	115,960
Maine	19	84	733,918	57	351,213	9	336,500	18	46,205
New Hampshire	11	41	662,810	34	398,044	6	261,750	1	3,016
Vermont	12	67	261,525	53	186,930	7	58,150	7	16,445
Massachusetts	24	65	2,864,632	29	185,856	29	2,646,029	7	32,747
Rhode Island	6	10	422,847	3	2,475	5	409,825	2	10,547
Connecticut	10	32	1,727,660	15	132,170	16	1,588,490	1	7,000
Middle Atlantic	75	294	23,818,426	151	2,394,741	120	21,347,021	23	76,664
New York	38	198	11,636,481	140	1,955,616	45	9,633,900	13	46,965
New Jersey	10	21	3,927,886	2	6,080	17	3,916,624	2	5,182
Pennsylvania	27	75	8,254,059	9	433,045	58	7,796,497	8	24,517
East North Central	246	600	34,662,148	243	836,837	215	33,420,087	142	405,224
Ohio	45	78	10,011,048	3	5,575	58	9,959,872	17	45,601
Indiana	35	63	5,935,446	13	31,970	38	5,864,940	12	38,536
Illinois	51	94	8,897,141	9	38,319	53	8,754,700	32	104,122
Michigan	58	174	6,754,993	98	383,864	35	6,210,250	41	160,879
Wisconsin	57	191	3,063,520	120	377,109	31	2,630,325	40	56,086
West North Central	429	816	10,513,455	105	1,395,467	222	8,038,131	489	1,079,857
Minnesota	78	169	2,112,859	37	155,896	52	1,765,120	80	191,843
Iowa	87	185	1,900,031	21	136,358	46	1,488,771	118	274,902
Missouri	65	98	2,421,462	5	292,600	36	1,982,950	57	145,912
North Dakota	13	43	506,348	1	240,000	18	224,790	24	41,558
South Dakota	32	60	543,747	7	324,496	10	151,750	43	67,501
Nebraska	72	130	1,231,368	30	240,207	22	857,850	78	133,311
Kansas	82	131	1,797,640	4	5,910	38	1,566,900	89	224,830
South Atlantic	120	350	21,081,843	162	3,601,921	125	17,282,586	63	197,336
Delaware	4	6	425,240	.....	.....	4	416,500	2	8,740
Maryland	10	21	1,891,612	3	271,325	14	1,604,000	4	16,287
District of Columbia	2	3	533,000	1	3,000	2	530,000	.....	.....
Virginia	22	61	3,410,408	34	398,130	15	2,983,481	12	28,797
West Virginia	9	33	2,577,189	10	100,880	16	2,472,925	7	3,384
North Carolina	27	82	4,386,682	56	1,207,850	18	3,167,750	8	11,082
South Carolina	12	38	2,072,739	26	937,725	9	1,133,500	3	1,514
Georgia	7	39	2,236,850	27	640,350	12	1,596,500	.....	.....
Florida	27	67	3,548,123	5	42,661	35	3,377,930	27	127,532
East South Central	34	109	15,986,601	43	3,742,080	47	12,222,885	19	21,636
Kentucky	8	20	3,317,787	5	540,860	13	2,768,900	2	8,027
Tennessee	6	39	7,542,298	26	1,910,000	11	5,632,000	2	298
Alabama	4	26	4,199,870	12	1,291,220	11	2,906,250	3	2,400
Mississippi	16	24	926,646	.....	.....	12	915,735	12	10,911
West South Central	146	325	14,647,028	35	944,000	121	13,225,371	169	477,657
Arkansas	15	29	1,180,320	8	388,340	11	757,045	10	34,935
Louisiana	30	57	2,511,566	.....	.....	20	2,378,900	37	132,666
Oklahoma	38	61	2,202,374	3	165,200	22	1,937,084	36	100,090
Texas	63	178	8,752,768	24	390,460	68	8,152,342	86	209,966
Mountain	133	373	8,150,333	190	4,509,939	76	3,404,077	107	236,317
Montana	8	27	1,017,192	19	898,950	5	115,800	3	2,442
Idaho	12	48	1,506,825	43	1,502,435	.....	.....	5	4,390
Wyoming	17	51	358,928	19	165,982	10	176,860	22	16,086
Colorado	35	75	1,232,842	27	251,092	23	927,818	25	53,932
New Mexico	14	32	745,001	3	24,830	14	670,400	15	49,771
Arizona	13	40	1,967,839	12	980,040	14	929,882	14	57,917
Utah	26	83	619,054	57	99,630	9	479,317	17	40,107
Nevada	8	17	702,652	10	586,980	1	104,000	6	11,672
Pacific	50	302	21,088,866	235	12,295,435	55	8,740,696	12	52,735
Washington	19	56	6,349,908	44	6,109,744	8	237,000	4	3,164
Oregon	11	68	2,597,777	52	2,398,047	12	194,710	4	5,020
California	20	178	12,141,181	139	3,787,644	35	8,308,986	4	44,551

NOTES: [a] Total includes 107 duplications because of utilities having generating plants in more than one state.
[b] Each type of prime mover at combination plants is counted as a separate plant.

Capacity Additions Reported to Electrical World—Kw

New England

Power Companies	Prime Mover	Capacity End 1957	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Bangor Hydro-Electric	Hydro	39,087	.....	.....	.....	.....	.....	.....
	Steam	28,000	.....	.....	.....	.....	20,000	20,000
	IC	18,000	.....	8,000	6,000	6,000	.....	20,000
	Total	85,087	.....	8,000	6,000	6,000	20,000	40,000
Boston Edison	Hydro	50	.....	.....	.....	.....	.....	.....
	Steam	1,051,360	125,000	.....	125,000	.....	.....	125,000
	Total	1,051,410	125,000	.....	125,000	.....	.....	125,000
Central Vermont P S	Hydro	40,000	.....	.....	10,000	.....	.....	10,000
	Steam	4,000	.....	.....	.....	.....	.....	.....
	IC	20,300	.....	.....	.....	20,500	.....	20,500
	Total	64,300	.....	.....	10,000	20,500	.....	30,500
Citizens Utilities Co	Hydro	6,840	.....	.....	3,000	.....	.....	3,000
	Steam	3,200	.....	.....	.....	.....	.....	.....
	IC	12,210	.....	2,000	.....	.....	.....	2,000
	Total	22,250	.....	2,000	3,000	.....	.....	5,000
Connecticut L & P	Hydro	111,920	.....	.....	.....	.....	.....	.....
	Steam	655,000	.....	150,000	.....	.....	.....	150,000
	IC	24,000	.....	.....	.....	.....	.....	.....
	Total	790,920	.....	150,000	.....	.....	.....	150,000
Green Mountain Power	Hydro	25,680	.....	.....	.....	.....	.....	.....
	Steam	36,000	.....	.....	.....	.....	.....	.....
	IC	4,000	.....	.....	2,000	5,000	.....	7,000
	Total	65,680	.....	.....	2,000	5,000	.....	7,000
Hartford Electric Light	Hydro	9,600	.....	.....	.....	.....	.....	.....
	Steam	489,240	.....	.....	.....	.....	200,000	200,000
	Total	498,840	.....	.....	.....	.....	200,000	200,000
Holyoke Water Power	Hydro	26,056	.....	.....	.....	.....	.....	.....
	Steam	42,500	.....	137,500	.....	.....	.....	137,500
	Total	68,556	.....	137,500	.....	.....	.....	137,500
Maine Public Service	Hydro	2,300	.....	.....	.....	.....	.....	.....
	Steam	19,000	.....	.....	.....	.....	16,500	16,500
	IC	13,300	4,200	.....	.....	.....	.....	.....
	Total	34,600	4,200	.....	.....	.....	16,500	16,500
Montaup Electric	Steam	290,000	115,000	.....	.....	.....	.....	.....
New England Electric System	Hydro	470,024	.....	.....	.....	.....	.....	.....
	Steam	937,133	.....	.....	.....	.....	450,000	450,000
	IC	10,000	.....	.....	.....	.....	.....	.....
	Total	1,417,157	.....	.....	.....	.....	450,000	450,000
New England Gas & Electric	Steam	222,250	.....	.....	.....	.....	66,000	66,000
	IC	2,527	.....	.....	.....	.....	.....	.....
	Total	224,777	.....	.....	.....	.....	66,000	66,000

Middle Atlantic (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Consolidated Edison	Steam	5,008,200	325,000	360,000	255,000	360,000	360,000	1,335,000
Duquesne Light	Steam	1,223,700	.....	172,000	.....	.....	.....	172,000
Long Island Lighting	Steam	930,100	.....	185,000	.....	185,000	.....	370,000
Luzerne Electric	Steam	111,000	44,000	.....	.....	.....	.....	.....
Metropolitan Edison	Hydro	19,620	.....	.....	.....	.....	.....	.....
	Steam	595,500	.....	.....	.....	250,000	.....	250,000
	Total	615,120	.....	.....	.....	250,000	.....	250,000
New Jersey P & L	Hydro	.....	.....	.....	.....	.....	262,500	262,500
	Steam	128,000	.....	.....	.....	.....	.....	.....
	Total	128,000	.....	.....	.....	.....	262,500	262,500
Niagara-Mohawk	Hydro	866,662	17,300	.....	.....	.....	.....	.....
	Steam	2,499,000	214,000	210,000	.....	.....	.....	210,000
	IC	4,000	4,000	.....	.....	.....	.....	.....
	Total	3,369,662	235,300	210,000	.....	.....	.....	210,000
Orange & Rockland Utilities	Hydro	43,750	.....	.....	.....	.....	.....	.....
	Steam	122,000	.....	.....	.....	.....	125,000	125,000
	Total	165,750	.....	.....	.....	.....	125,000	125,000
Pennsylvania Electric	Hydro	52,700	.....	.....	.....	.....	.....	.....
	Steam	1,047,304	182,000	182,000	.....	.....	.....	182,000
	Total	1,100,004	182,000	182,000	.....	.....	.....	182,000
Pennsylvania Power & Light	Hydro	149,800	.....	.....	.....	.....	40,000	40,000
	Steam	1,231,030	.....	.....	300,000	.....	.....	300,000
	Total	1,380,830	.....	.....	300,000	.....	40,000	340,000
Philadelphia Electric	Hydro	252,000	.....	.....	.....	.....	.....	.....
	Steam	2,785,250	325,000	325,000	.....	.....	.....	325,000
	IC	4,200	4,200	.....	42,000	.....	.....	42,000
	Total	3,041,450	329,200	325,000	42,000	.....	.....	367,000
Public Service E & G	Steam	2,864,300	290,000	610,000	320,000	342,000	.....	1,272,000
Rochester G & E	Hydro	47,390	.....	.....	.....	.....	.....	.....
	Steam	388,100	83,500	.....	.....	.....	.....	.....
	Total	435,490	83,500	.....	.....	.....	.....	.....
West Penn Power	Hydro	50,000	.....	.....	.....	.....	.....	.....
	Steam	1,171,025	163,200	.....	.....	.....	.....	.....
	Total	1,221,025	163,200	.....	.....	.....	.....	.....
Total	**Hydro**	**1,528,942**	**17,300**	.....	.....	.....	**302,500**	**302,500**
	Steam	**20,774,009**	**1,766,700**	**2,044,000**	**875,000**	**1,273,000**	**625,000**	**4,817,000**
	IC	**8,700**	**8,200**	.....	**42,000**	.....	.....	**42,000**
	Total	**22,311,651**	**1,792,200**	**2,044,000**	**917,000**	**1,273,000**	**927,500**	**5,161,500**

New England (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Public Service Co. of New Hampshire	Hydro	73,710	.....	.....	.....	.....	.....	.....
	Steam	261,750	.....	100,000	.....	.....	100,000	200,000
	IC	3,000	.....	.....	.....	.....	.....	.....
	Total	338,460	.....	100,000	.....	.....	100,000	200,000
United Illuminating	Steam	356,000	.....	.....	160,000	.....	.....	160,000
Yankee Atomic Elec	Steam	.....	.....	145,000	.....	.....	.....	145,000
Total	**Hydro**	**805,267**	.....	.....	**13,000**	.....	.....	**13,000**
	Steam	**4,395,433**	**240,000**	**532,500**	**285,000**	.....	**852,500**	**1,670,000**
	IC	**107,337**	**4,200**	**10,000**	**8,000**	**31,500**	.....	**49,500**
	Total	**5,308,037**	**244,200**	**542,500**	**306,000**	**31,500**	**852,500**	**1,732,500**
Municipal, State and Power District Systems								
Braintree, Mass	Steam	32,500	12,500	.....	.....	.....	.....	.....
Burlington, Vt	Steam	30,000	.....	.....	.....	.....	22,000	22,000
Hudson, Mass	IC	11,850	3,000	.....	.....	.....	5,000	5,000
Taunton, Mass	Steam	50,500	16,500	.....	.....	.....	.....	.....
Wallingford, Conn	Steam	22,500	.....	.....	.....	40,000	.....	40,000
Total	**Steam**	**135,500**	**29,000**	.....	.....	**40,000**	**22,000**	**62,000**
	IC	**11,850**	**3,000**	.....	.....	.....	**5,000**	**5,000**
	Total	**147,350**	**32,000**	.....	.....	**40,000**	**27,000**	**67,000**
New England	**Hydro**	**805,267**	.....	.....	**13,000**	.....	.....	**13,000**
Total All Agencies	**Steam**	**4,530,933**	**269,000**	**532,500**	**285,000**	**40,000**	**874,500**	**1,732,000**
	IC	**119,187**	**7,200**	**10,000**	**8,000**	**31,500**	**5,000**	**54,500**
	Total	**5,455,387**	**276,200**	**542,500**	**306,000**	**71,500**	**879,500**	**1,799,500**

Middle Atlantic

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Atlantic City Electric	Steam	410,500	.....	.....	.....	136,000	.....	136,000
	IC	500	.....	.....	.....	.....	.....	.....
	Total	411,000	.....	.....	.....	136,000	.....	136,000
Central Hudson G & E	Hydro	47,020	.....	.....	.....	.....	.....	.....
	Steam	259,000	140,000	.....	.....	.....	140,000	140,000
	Total	306,020	140,000	.....	.....	.....	140,000	140,000

Middle Atlantic (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Municipal, State and Power District Systems								
Grove City, Pa	IC	6,045	.....	2,000	.....	.....	.....	2,000
Lansdale, Pa	Steam	25,500	12,500	.....	.....	.....	.....	.....
N. Y. State Power Authority	Hydro	912,000	399,000	.....	1,580,000	610,000	.....	2,190,000
Quakertown, Pa	Steam	6,000	.....	.....	.....	.....	.....	.....
	IC	2,150	.....	1,750	.....	.....	.....	1,750
	Total	8,150	.....	1,750	.....	.....	.....	1,750
Rockville Centre, N. Y.	IC	15,148	.....	3,500	2,000	.....	.....	5,500
Vineland, N. J.	Steam	36,000	.....	16,500	.....	.....	.....	16,500
Weatherly, Pa	IC	.....	.....	.....	.....	.....	2,000	2,000
Total	**Hydro**	**912,000**	**399,000**	.....	**1,580,000**	**610,000**	.....	**2,190,000**
	Steam	**67,500**	**12,500**	**16,500**	.....	.....	.....	**16,500**
	IC	**23,343**	.....	**7,250**	**2,000**	.....	**2,000**	**11,250**
	Total	**1,002,843**	**411,500**	**23,750**	**1,582,000**	**610,000**	**2,000**	**2,217,750**
Middle Atlantic	**Hydro**	**2,440,942**	**416,300**	.....	**1,580,000**	**610,000**	**302,500**	**2,492,500**
Total All Agencies	**Steam**	**20,841,509**	**1,779,200**	**2,060,500**	**875,000**	**1,273,000**	**625,000**	**4,833,500**
	IC	**32,043**	**8,200**	**7,250**	**44,000**	.....	**2,000**	**53,250**
	Total	**23,314,494**	**2,203,700**	**2,067,750**	**2,499,000**	**1,883,000**	**929,500**	**7,379,250**

East North Central

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Central Illinois E & G	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	155,250	.....	.....	55,000	.....	.....	55,000
	Total	156,450	.....	.....	55,000	.....	.....	55,000
Central Illinois Light	Steam	326,400	.....	125,000	.....	.....	.....	125,000
	IC	2,100	.....	.....	.....	.....	.....	.....
	Total	328,500	.....	125,000	.....	.....	.....	125,000
Central Illinois P. S.	Steam	480,000	.....	200,000	.....	.....	.....	200,000
Cincinnati G & E	Steam	1,067,000	.....	172,000	.....	250,000	.....	422,000

East North Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Cleveland Electric Illuminating	Steam	1,886,000	242,000	.....	.....	235,000	.....	235,000
Columbus and Southern Ohio	Steam	765,000	150,000	.....	.....	150,000	.....	150,000
Commonwealth Edison	Hydro	5,375	.....	.....	.....	.....	.....	.....
	Steam	5,152,667	625,000	180,000	305,000	610,000	500,000	1,595,000
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	5,159,042	625,000	180,000	305,000	610,000	500,000	1,595,000
Consumers Power	Hydro	150,940	.....	.....	.....	.....	.....	.....
	Steam	2,120,100	265,000	.....	265,000	265,000	315,000	845,000
	IC	7,522	800	.....	.....	.....	.....	.....
	Total	2,278,562	265,800	.....	265,000	265,000	315,000	845,000
Dayton P & L	Steam	770,000	130,000	.....	.....	.....	.....	.....
Detroit Edison	Hydro	7,850	.....	.....	.....	.....	.....	.....
	Steam	3,491,500	325,000	150,000	325,000	.....	.....	475,000
	Total	3,499,350	325,000	150,000	325,000	.....	.....	475,000
Edison Sault Electric	IC	7,662	.....	4,000	2,000	.....	.....	6,000
Illinois Power	Hydro	2,280	.....	.....	.....	.....	.....	.....
	Steam	976,840	227,000	.....	.....	.....	.....	.....
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	981,120	227,000	.....	.....	.....	.....	.....
Indiana & Michigan Electric	Hydro	23,504	.....	.....	.....	.....	.....	.....
	Steam	954,500	.....	450,000	.....	.....	.....	450,000
	Total	978,004	.....	450,000	.....	.....	.....	450,000
Indianapolis P & L	Steam	696,000	.....	.....	108,000	.....	.....	108,000
Lake Superior District Power	Hydro	12,000	.....	.....	.....	.....	.....	.....
	Steam	80,000	.....	.....	.....	.....	33,000	33,000
	IC	4,000	.....	.....	.....	.....	.....	.....
	Total	96,000	.....	.....	.....	.....	33,000	33,000
Madison G & E	Steam	129,000	.....	.....	44,000	.....	.....	44,000
Northern Indiana P. S.	Hydro	19,005	.....	.....	.....	.....	.....	.....
	Steam	622,330	276,200	.....	.....	193,000	.....	193,000
	Total	641,335	276,200	.....	.....	193,000	.....	193,000
Northwestern Wisconsin Electric	Hydro	1,312	.....	.....	.....	.....	.....	.....
	IC	3,470	.....	750	.....	.....	.....	750
	Total	4,782	.....	750	.....	.....	.....	750
Ohio Edison Co	Steam	1,753,350	170,000	170,000	170,000	170,000	.....	510,000
Ohio Power	Steam	680,000	225,000	450,000	.....	.....	.....	450,000

East North Central (continued)

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Lansing, Mich	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	226,000	.....	.....	44,000	.....	.....	44,000
	Total	227,200	.....	.....	44,000	.....	.....	44,000
Newton Falls, Ohio	IC	4,373	.....	.....	2,000	.....	.....	2,000
Orrville, Ohio	Steam	16,500	.....	22,000	.....	.....	22,000	44,000
Peru, Ill	Steam	15,500	7,500	.....	.....	.....	.....	.....
Peru, Ind	Steam	41,500	22,000	.....	.....	.....	.....	.....
Petoskey, Mich	Hydro	870	.....	.....	.....	.....	1,000	1,000
	IC	5,750	.....	.....	.....	.....	.....	.....
	Total	6,620	.....	.....	.....	.....	1,000	1,000
Piqua, Ohio	Steam	33,000	.....	20,000	.....	.....	20,000	40,000
Rensselaer, Ind	IC	7,080	.....	.....	.....	2,500	.....	2,500
Springfield, Ill	Steam	80,000	.....	33,000	.....	.....	.....	33,000
Sullivan, Ill	IC	5,035	.....	.....	2,000	.....	.....	2,000
Tipp City, Ohio	Steam	1,500	.....	.....	.....	.....	.....	.....
	IC	2,480	.....	2,000	.....	.....	.....	2,000
	Total	3,980	.....	2,000	.....	.....	.....	2,000
Traverse City, Mich.	Hydro	1,150	.....	.....	.....	.....	.....	.....
	Steam	15,000	.....	.....	.....	.....	16,000	16,000
	Total	16,150	.....	.....	.....	.....	16,000	16,000
Winnetka, Ill	Steam	15,500	.....	10,000	.....	.....	.....	10,000
Woodstock, Ill	Steam	14,000	.....	.....	12,000	.....	.....	12,000
	IC	2,910	.....	.....	.....	.....	.....	.....
	Total	16,910	.....	.....	12,000	.....	.....	12,000
Wyandotte, Mich	Steam	46,000	22,500	.....	.....	.....	.....	.....
Zeeland, Mich	IC	6,648	.....	.....	.....	.....	3,000	3,000
Total	**Hydro**	**3,220**	.....	.....	.....	.....	**1,000**	**1,000**
	Steam	**876,000**	**64,500**	**92,500**	**78,000**	.....	**163,000**	**333,500**
	IC	**56,398**	**3,400**	**8,000**	**9,000**	**2,500**	**3,000**	**22,500**
	Total	**935,618**	**67,900**	**100,500**	**87,000**	**2,500**	**167,000**	**357,000**
Cooperatives								
Dairyland Power	Hydro	21,600	.....	.....	.....	.....	.....	.....
	Steam	178,750	.....	80,000	.....	.....	.....	80,000
	IC	13,500	.....	.....	.....	.....	.....	.....
	Total	213,850	.....	80,000	.....	.....	.....	80,000

East North Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Public Service Co of Indiana	Steam	1,252,000	150,000	150,000	150,000	.....	.....	300,000
Toledo Edison	Hydro	5,000	.....	.....	.....	.....	.....	.....
	Steam	653,250	140,625	.....	.....	.....	141,000	141,000
	Total	658,250	140,625	.....	.....	.....	141,000	141,000
Upper Peninsula Power	Hydro	14,000	.....	.....	.....	.....	.....	.....
	Steam	56,200	15,600	.....	.....	.....	.....	.....
	Total	70,200	15,600	.....	.....	.....	.....	.....
Wisconsin Electric Power	Hydro	240	.....	.....	.....	.....	.....	.....
	Steam	1,592,500	275,000	.....	275,000	.....	.....	275,000
	Total	1,592,740	275,000	.....	275,000	.....	.....	275,000
Wisconsin P & L	Hydro	42,000	.....	.....	.....	.....	.....	.....
	Steam	422,200	100,000	.....	.....	100,000	.....	100,000
	Total	464,200	100,000	.....	.....	100,000	.....	100,000
Wisconsin Public Service	Hydro	63,296	.....	.....	.....	.....	.....	.....
	Steam	337,500	.....	85,000	.....	.....	.....	85,000
	IC	3,000	.....	.....	.....	.....	.....	.....
	Total	403,796	.....	85,000	.....	.....	.....	85,000
Total	**Hydro**	**348,002**	.....	.....	.....	.....	.....	.....
	Steam	**26,419,587**	**3,316,425**	**2,132,000**	**1,697,000**	**1,973,000**	**989,000**	**6,791,000**
	IC	**30,754**	**800**	**4,750**	**2,000**	.....	.....	**6,750**
	Total	**26,798,343**	**3,317,225**	**2,136,750**	**1,699,000**	**1,973,000**	**989,000**	**6,797,750**
Municipal, State and Power District Systems								
Bryan, Ohio	IC	6,750	.....	.....	5,000	.....	.....	5,000
Carmi, Ill	IC	7,856	3,400	.....	.....	.....	.....	.....
Cedarborg, Wis	IC	2,700	.....	4,000	.....	.....	.....	4,000
Celina, Ohio	Steam	5,000	.....	7,500	.....	.....	.....	7,500
Cleveland, Ohio	Steam	137,500	.....	.....	.....	.....	50,000	50,000
Deshler, Ohio	IC	2,266	.....	1,000	.....	.....	.....	1,000
Detroit, Mich	Steam	170,000	.....	.....	.....	.....	40,000	40,000
Dover, Ohio	Steam	15,000	.....	.....	.....	.....	15,000	15,000
Grayling, Mich	IC	2,550	.....	1,000	.....	.....	.....	1,000
Highland, Ill	Steam	12,500	12,500	.....	.....	.....	.....	.....
Holland, Mich	Steam	31,500	.....	.....	22,000	.....	.....	22,000

East North Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Washington Island Electric	IC	570	.....	150	.....	.....	.....	150
Wolverine Electric Coop	IC	24,900	6,500	.....	3,500	.....	.....	3,500
Total	Hydro	21,600	.....	.....	.....	.....	.....	.....
	Steam	178,750	.....	80,000	.....	.....	.....	80,000
	IC	38,970	6,500	150	3,500	.....	.....	3,650
	Total	239,320	6,500	80,150	3,500	.....	.....	83,650
East North Central	**Hydro**	**372,822**	.....	.....	.....	.....	**1,000**	**1,000**
Total All Agencies	**Steam**	**27,474,337**	**3,380,925**	**2,304,500**	**1,775,000**	**1,973,000**	**1,152,000**	**7,204,500**
	IC	**126,122**	**10,700**	**12,900**	**14,500**	**2,500**	**3,000**	**32,900**
	Total	**27,973,281**	**3,391,625**	**2,317,400**	**1,789,500**	**1,975,500**	**1,156,000**	**7,238,400**

West North Central

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Black Hills P & L	Hydro	1,346	.....	.....	.....	.....	.....	.....
	Steam	80,500	.....	22,000	.....	.....	22,000	44,000
	IC	7,880	.....	.....	.....	.....	.....	.....
	Total	89,726	.....	22,000	.....	.....	22,000	44,000
Central E & G	Hydro	250	.....	.....	.....	.....	.....	.....
	IC	7,335	1,000	.....	1,000	.....	2,000	3,000
	Total	7,585	1,000	.....	1,000	.....	2,000	3,000
Central Kansas Power	Steam	67,650	23,000	.....	.....	.....	48,000	48,000
	IC	5,535	.....	.....	.....	.....	.....	.....
	Total	73,185	23,000	.....	.....	.....	48,000	48,000
Interstate Power	Hydro	3,242	.....	.....	.....	.....	.....	.....
	Steam	239,750	43,000	.....	.....	84,000	.....	84,000
	IC	4,035	.....	1,000	.....	.....	.....	1,000
	Total	247,027	43,000	1,000	.....	84,000	.....	85,000
Iowa Electric L & P	Hydro	3,570	.....	.....	.....	.....	.....	.....
	Steam	314,500	.....	.....	75,000	.....	.....	75,000
	IC	49,643	.....	2,000	.....	.....	.....	2,000
	Total	367,713	.....	2,000	75,000	.....	.....	77,000

West North Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Iowa-Illinois G & E	Hydro	4,000	.....	.....	.....	.....	.....	.....
	Steam	240,079	.....	.....	125,000	.....	.....	125,000
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	245,079	.....	.....	125,000	.....	.....	125,000
Iowa P & L	Steam	350,500	.....	.....	.....	.....	144,000	144,000
	IC	8,672	.....	.....	.....	.....	.....	.....
	Total	359,172	.....	.....	.....	.....	144,000	144,000
Iowa Public Service	Hydro	2,051	.....	.....	.....	.....	.....	.....
	Steam	213,800	.....	.....	.....	.....	125,000	125,000
	IC	29,295	.....	.....	.....	.....	.....	.....
	Total	245,146	.....	.....	.....	.....	125,000	125,000
Kansas City P & L	Steam	816,000	.....	186,000	.....	.....	186,000	372,000
Kansas G & E	Steam	523,000	124,900	.....	160,000	.....	160,000	320,000
Kansas P & L	Hydro	1,060	.....	.....	.....	.....	.....	.....
	Steam	410,000	.....	134,000	.....	.....	175,000	309,000
	IC	2,798	.....	.....	.....	.....	.....	.....
	Total	413,858	.....	134,000	.....	.....	175,000	309,000
Minnesota P & L	Hydro	106,665	.....	.....	.....	.....	.....	.....
	Steam	294,000	.....	70,000	.....	.....	.....	70,000
	Total	400,665	.....	70,000	.....	.....	.....	70,000
Missouri P S	Hydro	1,600	.....	.....	.....	.....	.....	.....
	Steam	71,000	.....	45,500	45,500	.....	.....	91,000
	IC	4,413	.....	.....	.....	.....	.....	.....
	Total	77,013	.....	45,500	45,500	.....	.....	91,000
Northern States Power	Hydro	39,070	.....	.....	.....	.....	.....	.....
	Steam	1,218,550	172,000	172,000	.....	66,000	220,000	458,000
	IC	30,415	.....	.....	.....	.....	.....	.....
	Total	1,288,035	172,000	172,000	.....	66,000	220,000	458,000
Northwestern P S	Steam	28,500	.....	.....	.....	.....	.....	.....
	IC	15,588	.....	1,000	12,500	6,000	.....	19,500
	Total	44,088	.....	1,000	12,500	6,000	.....	19,500
Otter Tail Power	Hydro	5,745	.....	.....	.....	.....	.....	.....
	Steam	147,500	55,000	.....	.....	.....	.....	.....
	IC	23,725	.....	.....	.....	.....	.....	.....
	Total	176,970	55,000	.....	.....	.....	.....	.....
St. Joseph L & P	Steam	88,500	.....	.....	.....	.....	44,000	44,000
	IC	2,205	.....	.....	.....	.....	.....	.....
	Total	90,705	.....	.....	.....	.....	44,000	44,000
Union Electric	Hydro	293,600	.....	.....	.....	.....	.....	.....
	Steam	1,480,000	.....	.....	300,000	.....	300,000	600,000
	Total	1,773,600	.....	.....	300,000	.....	300,000	600,000

West North Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Fairmont, Minn	Steam	22,000	10,000	.....	.....	.....	16,500	16,500
Fremont, Nebr	Steam	37,500	.....	.....	.....	16,500	.....	16,500
Fulton, Mo	Steam	12,000	6,000	.....	.....	.....	.....	.....
Girard, Kan	IC	3,120	.....	.....	2,000	.....	.....	2,000
Grundy Center, Iowa	Steam	1,250	.....	.....	.....	.....	1,500	1,500
Halstad, Minn	IC	1,060	.....	.....	.....	.....	1,000	1,000
Hannibal, Mo	Steam	23,500	.....	.....	16,500	.....	.....	16,500
Hoisington, Kan	IC	.....	.....	2,000	.....	.....	.....	2,000
Horton, Kan	IC	1,650	.....	1,335	.....	.....	.....	1,335
Kansas City, Kan	Steam	194,410	.....	.....	.....	60,000	.....	60,000
Litchfield, Minn	Hydro	.....	.....	.....	.....	.....	7,500	7,500
	Steam	3,750	.....	.....	.....	.....	.....	.....
	IC	4,000	.....	.....	.....	.....	.....	.....
	Total	7,750	.....	.....	.....	.....	7,500	7,500
Moorhead, Minn	Steam	12,000	.....	.....	.....	.....	11,500	11,500
	IC	10,000	10,000	.....	.....	.....	.....	.....
	Total	22,000	10,000	.....	.....	.....	11,500	11,500
Mountain Lake, Minn	IC	3,673	1,360	.....	.....	.....	.....	.....
Muscatine, Iowa	Steam	49,250	22,000	.....	.....	.....	.....	.....
	IC	300	.....	.....	.....	.....	.....	.....
	Total	49,550	22,000	.....	.....	.....	.....	.....
Nebraska Public Power System	Hydro	129,601	.....	.....	.....	.....	.....	.....
	Steam	246,500	.....	.....	.....	.....	150,000	150,000
	IC	2,976	.....	.....	.....	.....	.....	.....
	Total	379,077	.....	.....	.....	.....	150,000	150,000
New Ulm, Minn	Steam	15,000	.....	.....	.....	.....	10,000	10,000
North Branch, Minn	IC	648	.....	675	.....	.....	675	1,350
Omaha Public Power District	Steam	464,000	108,000	.....	.....	.....	135,000	135,000
Owatonna, Minn	Steam	14,500	.....	.....	.....	12,000	.....	12,000
Poplar Bluff, Mo	Steam	14,500	7,500	.....	.....	.....	.....	.....
Rochester, Minn	Hydro	1,840	.....	.....	.....	.....	.....	.....
	Steam	31,500	.....	.....	.....	22,000	.....	22,000
	Total	33,340	.....	.....	.....	22,000	.....	22,000

West North Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Western Light & Telephone	Steam	75,600	.....	.....	.....	40,000	.....	40,000
	IC	19,041	.....	.....	.....	.....	.....	.....
	Total	94,641	.....	.....	.....	40,000	.....	40,000
Total	**Hydro**	**462,199**	.....	.....	.....	.....	.....	.....
	Steam	**6,659,429**	**417,900**	**629,500**	**705,500**	**190,000**	**1,424,000**	**2,949,000**
	IC	**211,580**	**1,000**	**4,000**	**13,500**	**6,000**	**2,000**	**25,500**
	Total	**7,333,208**	**418,900**	**633,500**	**719,000**	**196,000**	**1,426,000**	**2,974,500**
Municipal, State and Power District Systems								
Ames, Iowa	Steam	28,150	.....	.....	.....	.....	15,000	15,000
	IC	1,000	.....	.....	.....	.....	.....	.....
	Total	29,150	.....	.....	.....	.....	15,000	15,000
Auburn, Neb	Hydro	1,100	.....	.....	.....	.....	.....	.....
	IC	4,900	1,100	1,100	.....	.....	2,500	3,600
	Total	6,000	1,100	1,100	.....	.....	2,500	3,600
Barnesville, Minn	IC	.....	.....	.....	.....	.....	750	750
Carthage, Mo	IC	15,080	.....	.....	.....	5,000	.....	5,000
Cedar Falls, Iowa	Hydro	1,200	.....	.....	.....	.....	.....	.....
	Steam	14,000	.....	.....	.....	.....	12,500	12,500
	IC	1,200	.....	.....	.....	.....	.....	.....
	Total	16,400	.....	.....	.....	.....	12,500	12,500
Columbia, Mo	Steam	35,000	.....	.....	.....	22,000	.....	22,000
Consumers Public Power District	Hydro	8,940	.....	.....	.....	.....	.....	.....
	Steam	25,125	.....	.....	100,000	.....	116,500	216,500
	IC	13,150	.....	.....	.....	.....	.....	.....
	Total	47,215	.....	.....	100,000	.....	116,500	216,500
Cascade, Iowa	IC	1,987	.....	.....	.....	.....	1,000	1,000
Clay City, Kan	Steam	7,500	.....	.....	.....	.....	5,000	5,000
	IC	900	.....	.....	.....	2,000	.....	2,000
	Total	8,400	.....	.....	.....	2,000	5,000	7,000
David City, Neb	Steam	625	.....	.....	.....	.....	.....	.....
	IC	2,000	.....	1,500	.....	.....	.....	1,500
	Total	2,625	.....	1,500	.....	.....	.....	1,500
Elk River, Minn	Hydro	230	.....	.....	.....	.....	.....	.....
	IC	1,100	.....	.....	2,500	.....	.....	2,500
	Total	1,330	.....	.....	2,500	.....	.....	2,500
Emerson, Neb	IC	400	.....	440	.....	.....	.....	440
Fairbury, Neb	Hydro	240	.....	.....	.....	.....	.....	.....
	Steam	8,500	.....	.....	.....	.....	12,000	12,000
	Total	8,740	.....	.....	.....	.....	12,000	12,000

West North Central (continued)

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
St. Francis, Kan	IC	2,550	832	.....	.....	.....	.....	.....
Schuyler, Neb	Steam	9,000	5,000	.....	.....	.....	.....	.....
Sidney, Neb	IC	8,210	.....	.....	.....	.....	3,500	3,500
Sikeston, Mo	Steam	6,250	6,250	.....	.....	.....	.....	.....
	IC	2,700	.....	.....	.....	.....	.....	.....
	Total	8,950	6,250	.....	.....	.....	.....	.....
Spencer, Iowa	Steam	10,000	.....	7,500	.....	.....	.....	7,500
Springfield, Mo	Steam	67,500	.....	44,000	.....	.....	66,000	110 000
Stockton, Kan	IC	2,827	.....	.....	900	.....	1,000	1,900
Sumner, Iowa	IC	3,035	.....	.....	.....	1,500	.....	1,500
Tecumseh, Neb	IC	3,400	.....	1,400	.....	.....	.....	1,400
Virginia, Minn	Steam	17,500	.....	.....	.....	.....	7,500	7,500
Wahoo, Neb	IC	4,675	.....	2,100	.....	.....	.....	2,100
Waverly, Iowa	Hydro	495	.....	.....	.....	.....	.....	.....
	IC	8,935	.....	1,500	.....	.....	3,500	5,000
	Total	9,430	.....	1,500	.....	.....	3,500	5,000
Wayne, Neb	IC	4,225	.....	2,000	.....	.....	2,500	4,500
Webster City, Iowa	Steam	7,875	.....	7,500	.....	.....	.....	7,500
West Bend, Iowa	IC	3,068	1,184	.....	.....	.....	.....	.....
West Point, Neb	IC	3,115	1,250	.....	.....	.....	.....	.....
Total	**Hydro**	**143,646**	.....	.....	.....	.....	**7,500**	**7,500**
	Steam	**1,378,685**	**164,750**	**59,000**	**116,500**	**132,500**	**559,000**	**867,000**
	IC	**115,884**	**15,726**	**14,050**	**5,400**	**8,500**	**16,425**	**44,375**
	Total	**1,638,215**	**180,476**	**73,050**	**121,900**	**141,000**	**582,925**	**918,875**
Cooperatives								
Central Electric Power	Steam	.....	.....	44,000	.....	.....	.....	44,000
Central Kansas Electric	Steam	.....	.....	.....	.....	20,000	.....	20,000
	IC	10,520	.....	.....	.....	.....	.....	.....
	Total	10,520	.....	.....	.....	20,000	.....	20,000
Corn Belt Power Coop	Steam	41,500	.....	33,000	.....	.....	.....	33,000
	IC	22,975	.....	.....	.....	.....	.....	.....
	Total	64,475	.....	33,000	.....	.....	.....	33,000
Eastern Iowa L & P	Steam	.....	.....	22,000	.....	22,000	.....	44,000

West North Central (continued)

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Northeast Missouri Electric Power	Steam	15,000	.....	.....	.....	.....	11,000	11,000
	IC	7,440	.....	.....	.....	.....	.....	.....
	Total	22,440	.....	.....	.....	.....	11,000	11,000
Rural Cooperative Power Ass'n.	Steam	27,000	.....	22,000	.....	.....	.....	22,000
	IC	20,670	.....	.....	.....	.....	.....	.....
	Total	47,670	.....	22,000	.....	.....	.....	22,000
Wheatland Electric.....	Steam	16,000	.....	.....	22,000	.....	.....	22,000
	IC	14,087	.....	.....	.....	.....	.....	.....
	Total	30,087	.....	.....	22,000	.....	.....	22,000
Total.....	**Steam**	**99,500**	.....	**121,000**	**22,000**	**42,000**	**11,000**	**196,000**
	IC	**75,692**	.....	.....	.....	.....	.....	.....
	Total	**175,192**	.....	**121,000**	**22,000**	**42,000**	**11,000**	**196,000**
Federal Agencies								
Corps of Engineers.....	Hydro	660,000	.....	160,000	.....	170,000	893,000	1,223,000
Total.....	**Hydro**	**660,000**	.....	**160,000**	.....	**170,000**	**893,000**	**1,223,000**
West North Central	**Hydro**	**1,265,845**	.....	**160,000**	.....	**170,000**	**900,500**	**1,230,500**
Total All Agencies	**Steam**	**8,137,614**	**582,650**	**809,500**	**844,000**	**364,500**	**1,994,000**	**4,012,000**
	IC	**403,156**	**16,726**	**18,050**	**18,900**	**14,500**	**18,425**	**69,875**
	Total	**9,806,615**	**599,376**	**987,550**	**862,900**	**549,000**	**2,912,925**	**5,312,375**

South Atlantic

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Appalachian Power.	Hydro	120,889	.....	.....	.....	220,000	.....	220,000
	Steam	1,982,011	.....	.....	225,000	.....	.....	225,000
	Total	2,102,900	.....	.....	225,000	220,000	.....	445,000
Baltimore G & E...	Steam	1,089,500	134,000	.....	191,000	.....	191,000	382,000
Carolina P & L....	Hydro	205,100	.....	.....	22,000	.....	.....	22,000
	Steam	865,500	.....	182,000	.....	240,000	.....	422,000
	Total	1,070,600	.....	182,000	22,000	240,000	.....	444,000
Delaware P & L....	Steam	407,000	.....	.....	.....	60,000	150,000	210,000
Duke Power.....	Hydro	504,000	.....	.....	.....	.....	350,000	350,000
	Steam	2,554,000	275,000	275,000	275,000	.....	.....	550,000
	Total	3,058,000	275,000	275,000	275,000	.....	350,000	900,000

South Atlantic (continued)

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Lakeland, Fla.....	Steam	82,500	25,000	.....	.....	.....	200,000	200,000
Orlando, Fla.....	Steam	103,000	.....	78,500	.....	.....	.....	78,500
	IC	33,000	.....	.....	.....	.....	.....	.....
	Total	136,000	.....	78,500	.....	.....	.....	78,500
St. Cloud, Fla.....	IC	5,100	1,000	.....	3,000	.....	.....	3,000
South Carolina Public Service Authority (Santee-Cooper)	Hydro	134,535	.....	.....	.....	.....	.....	.....
	Steam	88,000	.....	.....	.....	.....	120,000	120,000
	Total	222,535	.....	.....	.....	.....	120,000	120,000
Tallahassee, Fla...	Steam	71,500	.....	23,500	.....	.....	.....	23,500
Total.....	**Hydro**	**135,505**	.....	.....	**1,000**	.....	.....	**1,000**
	Steam	**408,500**	**25,000**	**124,000**	**22,000**	.....	**320,000**	**466,000**
	IC	**45,260**	**1,000**	.....	**3,000**	.....	.....	**3,000**
	Total	**589,265**	**26,000**	**124,000**	**26,000**	.....	**320,000**	**470,000**
Federal Agencies								
Corps of Engineers.	Hydro	440,000	.....	.....	.....	132,000	234,000	366,000
Total.....	**Hydro**	**440,000**	.....	.....	.....	**132,000**	**234,000**	**366,000**
South Atlantic	**Hydro**	**2,147,312**	**54,000**	.....	**23,000**	**382,000**	**784,000**	**1,189,000**
Total All Agencies	**Steam**	**15,819,406**	**1,221,955**	**1,492,455**	**1,207,000**	**1,500,000**	**1,666,000**	**5,865,455**
	IC	**64,328**	**2,000**	.....	**4,000**	.....	.....	**4,000**
	Total	**18,031,046**	**1,277,955**	**1,492,455**	**1,234,000**	**1,882,000**	**2,450,000**	**7,058,455**

East South Central

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Alabama Power....	Hydro	489,700	.....	.....	137,250	108,000	668,700	913,950
	Steam	1,436,250	225,000	.....	.....	.....	.....	.....
	Total	1,925,950	225,000	.....	137,250	108,000	668,700	913,950
Kentucky Utilities....	Hydro	30,540	.....	.....	.....	.....	.....	.....
	Steam	380,908	105,000	.....	.....	105,000	.....	105,000
	Total	411,448	105,000	.....	.....	105,000	.....	105,000
Louisville G & E.....	Hydro	80,320	.....	.....	.....	.....	.....	.....
	Steam	740,000	.....	.....	.....	156,250	.....	156,250
	Total	820,320	.....	.....	.....	156,250	.....	156,250
Mississippi Power...	Steam	222,500	.....	75,000	.....	112,000	.....	187,000

South Atlantic (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Florida Power Corp	Hydro	12,493	.....	.....	.....	.....	.....	.....
	Steam	722,000	75,000	.....	125,000	200,000	.....	325,000
	IC	3,000	.....	.....	.....	.....	.....	.....
	Total	737,493	75,000	.....	125,000	200,000	.....	325,000
Florida P & L	Steam	1,648,000	165,000	240,000	240,000	300,000	300,000	1,080,000
Florida Public Utilities	Hydro	170	.....	.....	.....	.....	.....	.....
	IC	10,920	1,000	.....	1,000	.....	.....	1,000
	Total	11,090	1,000	.....	1,000	.....	.....	1,000
Georgia Power	Hydro	417,270	54,000	.....	.....	30,000	.....	30,000
	Steam	1,414,000	75,000	.....	.....	.....	625,000	625,000
	Total	1,831,270	129,000	.....	.....	30,000	625,000	655,000
Gulf Power	Steam	230,000	75,000	.....	75,000	.....	.....	75,000
Monongahela Power	Steam	430,325	.....	165,000	.....	.....	.....	165,000
	IC	3,798	.....	.....	.....	.....	.....	.....
	Total	434,123	.....	165,000	.....	.....	.....	165,000
Potomac Electric	Steam	1,135,000	175,000	175,000	.....	175,000	.....	350,000
Savannah Electric & Power	Steam	149,500	52,500	.....	54,000	.....	80,000	134,000
South Carolina E & G	Hydro	174,360	.....	.....	.....	.....	.....	.....
	Steam	657,500	.....	.....	.....	125,000	.....	125,000
	IC	150	.....	.....	.....	.....	.....	.....
	Total	832,010	.....	.....	.....	125,000	.....	125,000
Tampa Electric	Steam	493,500	.....	161,000	.....	.....	.....	161,000
Virginia Electric & Power	Hydro	137,525	.....	.....	.....	.....	200,000	200,000
	Steam	1,633,070	170,455	170,455	.....	400,000	.....	570,455
	IC	1,200	.....	.....	.....	.....	.....	.....
	Total	1,771,795	170,455	170,455	.....	400,000	200,000	770,455
Total	**Hydro**	**1,571,807**	**54,000**	.....	**22,000**	**250,000**	**550,000**	**822,000**
	Steam	**15,410,906**	**1,196,955**	**1,368,455**	**1,185,000**	**1,500,000**	**1,346,000**	**5,399,455**
	IC	**19,068**	**1,000**	.....	**1,000**	.....	.....	**1,000**
	Total	**17,001,781**	**1,251,955**	**1,368,455**	**1,208,000**	**1,750,000**	**1,896,000**	**6,222,455**
Municipal, State and Power District Systems								
Bedford, Va	Hydro	970	.....	.....	1,000	.....	.....	1,000
Gainesville, Fla	Steam	37,000	.....	22,000	.....	.....	.....	22,000
	IC	1,160	.....	.....	.....	.....	.....	.....
	Total	38,160	.....	22,000	.....	.....	.....	22,000
Key West, Fla	Steam	26,500	.....	.....	22,000	.....	.....	22,000
	IC	6,000	.....	.....	.....	.....	.....	.....
	Total	32,500	.....	.....	22,000	.....	.....	22,000

East South Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Mississippi P & L	Steam	627,000	238,000	.....	.....	.....	150,000	150,000
	IC	2,943	.....	.....	.....	.....	.....	.....
	Total	629,943	238,000	.....	.....	.....	150,000	150,000
Southern Electric Generating	Steam	.....	.....	500,000	250,000	250,000	.....	1,000,000
Total	**Hydro**	**600,560**	.....	.....	**137,250**	**108,000**	**668,700**	**913,950**
	Steam	**3,406,658**	**568,000**	**575,000**	**250,000**	**623,250**	**150,000**	**1,598,250**
	IC	**2,943**	.....	.....	.....	.....	.....	.....
	Total	**4,010,161**	**568,000**	**575,000**	**387,250**	**731,250**	**818,700**	**2,512,200**
Municipal, State and Power District Systems								
Greenwood, Miss	Steam	25,500	.....	12,650	.....	.....	.....	12,650
Memphis, Tenn	Steam	750,000	540,000	.....	.....	.....	.....	.....
Owensboro, Ky	Steam	52,500	.....	.....	.....	.....	60,000	60,000
Yazoo City, Miss	Steam	20,000	.....	.....	.....	.....	11,500	11,500
Total	**Steam**	**848,000**	**540,000**	**12,650**	.....	.....	**71,500**	**84,150**
Cooperatives								
Alabama Electric Coop	Hydro	9,120	.....	.....	.....	.....	.....	.....
	Steam	37,000	22,000	.....	.....	50,000	.....	50,000
	IC	1,528	.....	.....	.....	.....	.....	.....
	Total	47,648	22,000	.....	.....	50,000	.....	50,000
East Kentucky REC	Steam	110,000	.....	66,000	.....	.....	100,000	166,000
Total	**Hydro**	**9,120**	.....	.....	.....	.....	.....	.....
	Steam	**147,000**	**22,000**	**66,000**	.....	**50,000**	**100,000**	**216,000**
	IC	**1,528**	.....	.....	.....	.....	.....	.....
	Total	**157,648**	**22,000**	**66,000**	.....	**50,000**	**100,000**	**216,000**
Federal Agencies								
Corps of Engineers	Hydro	583,000	24,000	12,000	.....	65,000	195,000	272,000
Tennessee Valley Authority	Hydro	2,377,900	.....	.....	162,000	97,200	.....	259,200
	Steam	7,647,250	950,000	500,000	.....	1,100,000	.....	1,600,000
	Total	10,025,150	950,000	500,000	162,000	1,197,200	.....	1,859,200
Total	**Hydro**	**2,960,900**	**24,000**	**12,000**	**162,000**	**162,200**	**195,000**	**531,200**
	Steam	**7,647,250**	**950,000**	**500,000**	.....	**1,100,000**	.....	**1,600,000**
	Total	**10,608,150**	**974,000**	**512,000**	**162,000**	**1,262,200**	**195,000**	**2,131,200**
East South Central	**Hydro**	**3,570,580**	**24,000**	**12,000**	**299,250**	**270,200**	**863,700**	**1,445,150**
Total All Agencies	**Steam**	**12,048,908**	**2,080,000**	**1,153,650**	**250,000**	**1,773,250**	**321,500**	**3,498,400**
	IC	**4,471**	.....	.....	.....	.....	.....	.....
	Total	**15,623,959**	**2,104,000**	**1,165,650**	**549,250**	**2,043,450**	**1,185,200**	**4,943,550**

West South Central

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Arkansas Power & Light	Hydro	65,300	.....	.....	.....	.....	.....	.....
	Steam	708,750	.....	.....	325,000	.....	.....	325,000
	Total	774,050	.....	.....	325,000	.....	.....	325,000
Central Louisiana Electric	Steam	171,750	.....	.....	100,000	.....	.....	100,000
	IC	16,121	.....	.....	.....	.....	.....	.....
	Total	187,871	.....	.....	100,000	.....	.....	100,000
Central P & L.....	Hydro	15,000	.....	.....	.....	.....	.....	.....
	Steam	658,000	175,000	110,000	.....	.....	175,000	285,000
	IC	1,480	.....	.....	.....	.....	.....	.....
	Total	674,480	175,000	110,000	.....	.....	175,000	285,000
Dallas P & L.....	Steam	838,850	.....	175,000	.....	175,000	.....	350,000
	Total	838,850	.....	175,000	.....	175,000	.....	350,000
El Paso Electric.....	Steam	262,000	.....	75,000	.....	.....	.....	75,000
Gulf States Utilities..	Steam	1,177,000	222,000	324,000	.....	220,000	440,000	984,000
Houston Lighting & Power	Steam	2,081,250	219,000	438,000	275,000	.....	350,000	1,063,000
Louisiana P & L.....	Steam	631,750	.....	.....	223,000	.....	.....	223,000
New Orleans P S...	Steam	528,000	.....	.....	.....	.....	227,000	227,000
Oklahoma G & E...	Steam	982,496	240,000	.....	.....	.....	240,000	240,000
	IC	13,099	.....	.....	.....	.....	.....	.....
	Total	995,595	240,000	.....	.....	.....	240,000	240,000
Public Service of Oklahoma	Steam	787,338	.....	.....	170,000	.....	185,000	355,000
	IC	6,000	.....	.....	.....	.....	.....	.....
	Total	793,338	.....	.....	170,000	.....	185,000	355,000
Southwestern P S....	Hydro	330	.....	.....	.....	.....	.....	.....
	Steam	639,000	.....	112,500	.....	112,500	112,500	337,500
	IC	11,670	1,000	.....	.....	.....	.....	.....
	Total	651,000	1,000	112,500	.....	112,500	112,500	337,500
Southwestern Electric Power	Steam	513,000	115,000	114,000	.....	.....	186,000	300,000
Texas Electric Service	Steam	1,137,655	175,000	240,000	.....	.....	.....	240,000
	IC	14,791	.....	.....	.....	.....	.....	.....
	Total	1,152,446	175,000	240,000	.....	.....	.....	240,000
Texas P & L.....	Steam	771,300	200,000	.....	.....	156,250	.....	156,250
	IC	16,350	.....	.....	.....	.....	.....	.....
	Total	787,650	200,000	.....	.....	156,250	.....	156,250

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Medina Electric.....	Steam	.....	.....	.....	44,000	22,000	.....	66,000
Western Farmers Electric Coop	Steam	74,000	44,000	.....	.....	.....	.....	.....
	IC	4,400	.....	.....	.....	.....	.....	.....
	Total	78,400	44,000	.....	.....	.....	.....	.....
Total.....	**Hydro**	**53,000**	.....	.....	.....	.....	.....	.....
	Steam	**130,000**	**44,000**	.....	**44,000**	**22,000**	**33,000**	**99,000**
	IC	**4,400**	.....	.....	.....	.....	.....	.....
	Total	**187,400**	**44,000**	.....	**44,000**	**22,000**	**33,000**	**99,000**
Federal Agencies								
Corps of Engineers..	Hydro	601,000	100,000	.....	190,000	.....	770,000	960,000
Total.....	**Hydro**	**601,000**	**100,000**	.....	**190,000**	.....	**770,000**	**960,000**
West South Central	**Hydro**	**734,630**	**100,000**	.....	**190,000**	.....	**770,000**	**960,000**
Total All Agencies	**Steam**	**13,149,524**	**1,614,150**	**1,705,000**	**1,237,000**	**765,750**	**2,257,500**	**5,965,250**
	IC	**171,269**	**6,337**	**4,500**	**1,000**	**2,860**	**7,500**	**15,860**
	Total	**14,055,423**	**1,720,487**	**1,709,500**	**1,428,000**	**768,610**	**3,035,000**	**6,941,110**

Mountain

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Arizona P S.....	Hydro	7,000	.....	.....	.....	.....	.....	.....
	Steam	384,600	.....	220,000	.....	110,000	355,000	685,000
	IC	16,900	.....	.....	.....	.....	.....	.....
	Total	408,500	.....	220,000	.....	110,000	355,000	685,000
Idaho Power.....	Hydro	706,345	112,500	.....	218,000	.....	400,000	618,000
Public Service Co of Colorado	Hydro	37,900	.....	.....	.....	.....	.....	.....
	Steam	795,100	115,000	48,000	.....	171,000	.....	219,000
	IC	1,950	.....	.....	.....	.....	.....	.....
	Total	834,950	115,000	48,000	.....	171,000	.....	219,000
Public Service Co of New Mexico	Steam	208,000	.....	49,000	.....	74,000	.....	123,000
Sierra Pacific Power.....	Hydro	9,400	.....	.....	.....	.....	.....	.....
	Steam	.....	.....	.....	.....	.....	66,000	66,000
	IC	650	.....	6,000	12,000	20,000	.....	38,000
	Total	10,050	.....	6,000	12,000	20,000	66,000	104,000

West South Central (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
West Texas Utilities	Steam	287,500	89,500	.....	.....	80,000	.....	80,000
	IC	26,292	.....	.....	1,000	.....	.....	1,000
	Total	313,792	89,500	.....	1,000	80,000	.....	81,000
Total	**Hydro**	**80,630**	.....	.....	.....	.....	.....	.....
	Steam	**12,175,639**	**1,435,500**	**1,588,500**	**1,093,000**	**743,750**	**1,915,500**	**5,340,750**
	IC	**105,803**	**1,000**	.....	**1,000**	.....	.....	**1,000**
	Total	**12,362,072**	**1,436,500**	**1,588,500**	**1,094,000**	**743,750**	**1,915,500**	**5,341,750**
Municipal, State and Power District Systems								
Austin, Texas	Steam	154,000	.....	100,000	.....	.....	100,000	200,000
Brownfield, Texas	IC	10,050	.....	4,500	.....	.....	.....	4,500
Bryan, Texas	Steam	44,650	.....	.....	.....	.....	.....	.....
	IC	4,790	.....	.....	.....	.....	7,500	7,500
	Total	49,440	.....	.....	.....	.....	7,500	7,500
Denton, Texas	Steam	25,300	.....	.....	.....	.....	22,000	22,000
	IC	12,350	.....	.....	.....	.....	.....	.....
	Total	37,650	.....	.....	.....	.....	22,000	22,000
Garland, Texas	Steam	.....	.....	16,500	.....	.....	.....	16,500
	IC	3,162	.....	.....	.....	.....	.....	.....
	Total	3,162	.....	16,500	.....	.....	.....	16,500
Jasper, Texas	IC	6,360	1,360	.....	.....	1,360	.....	1,360
Lafayette, La	Steam	20,650	22,000	.....	.....	.....	.....	.....
	IC	4,600	.....	.....	.....	.....	.....	.....
	Total	25,250	22,000	.....	.....	.....	.....	.....
Lindsay, Okla	IC	4,636	.....	.....	.....	1,500	.....	1,500
Piggott, Ark	IC	4,129	1,360	.....	.....	.....	.....	.....
San Antonio, Texas	Steam	568,635	100,000	.....	100,000	.....	165,000	265,000
Stillwater, Okla	Steam	30,650	12,650	.....	.....	.....	22,000	22,000
Teague, Texas	IC	3,653	957	.....	.....	.....	.....	.....
Vernon, Texas	IC	7,336	1,660	.....	.....	.....	.....	.....
Total	**Steam**	**843,885**	**134,650**	**116,500**	**100,000**	.....	**309,000**	**525,500**
	IC	**61,066**	**5,337**	**4,500**	.....	**2,860**	**7,500**	**14,860**
	Total	**904,951**	**139,987**	**121,000**	**100,000**	**2,860**	**316,500**	**540,360**
Cooperatives								
Brazos Electric Power	Hydro	53,000	.....	.....	.....	.....	.....	.....
	Steam	56,000	.....	.....	.....	.....	33,000	33,000
	Total	109,000	.....	.....	.....	.....	33,000	33,000

Mountain (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Southern Colorado Power	Hydro	1,500	.....	.....	.....	.....	.....	.....
	Steam	79,468	22,000	.....	.....	44,000	.....	44,000
	Total	80,968	22,000	.....	.....	44,000	.....	44,000
Southern Nevada Power	Steam	104,000	.....	.....	66,000	.....	.....	66,000
Tucson Gas, El & P	Steam	219,800	.....	80,000	.....	106,000	.....	186,000
	IC	13,000	.....	7,500	.....	.....	.....	7,500
	Total	232,800	.....	87,500	.....	106,000	.....	193,500
Utah P & L	Hydro	168,210	.....	.....	.....	.....	.....	.....
	Steam	510,750	.....	.....	.....	.....	500,000	500,000
	IC	4,470	1,000	.....	.....	.....	.....	.....
	Total	683,430	1,000	.....	.....	.....	500,000	500,000
Western Colorado Power	Hydro	13,232	.....	.....	.....	.....	.....	.....
	Steam	18,000	.....	.....	.....	.....	12,650	12,650
	Total	31,232	.....	.....	.....	.....	12,650	12,650
Total	**Hydro**	**943,587**	**112,500**	.....	**218,000**	.....	**400,000**	**618,000**
	Steam	**2,319,718**	**137,000**	**397,000**	**66,000**	**505,000**	**933,650**	**1,901,650**
	IC	**36,970**	**1,000**	**13,500**	**12,000**	**20,000**	.....	**45,500**
	Total	**3,300,275**	**250,500**	**410,500**	**296,000**	**525,000**	**1,333,650**	**2,565,150**
Municipal, State and Power District Systems								
Colorado Springs, Colo	Hydro	6,000	.....	.....	.....	.....	.....	.....
	Steam	80,000	.....	.....	.....	44,000	.....	44,000
	Total	86,000	.....	.....	.....	44,000	.....	44,000
Farmington, N. M.	Steam	16,735	.....	16,500	.....	.....	.....	16,500
Lamar, Colo	Steam	9,500	.....	.....	.....	.....	16,500	16,500
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	11,500	.....	.....	.....	.....	16,500	16,500
Raton, N. M.	Steam	6,000	.....	.....	.....	6,000	.....	6,000
Salt River Project	Hydro	70,890	.....	.....	.....	.....	.....	.....
	Steam	347,272	.....	.....	163,200	.....	.....	163,200
	IC	10,000	.....	.....	.....	.....	.....	.....
	Total	428,162	.....	.....	163,200	.....	.....	163,200
Total	**Hydro**	**76,890**	.....	.....	.....	.....	.....	.....
	Steam	**459,507**	.....	**16,500**	**163,200**	**50,000**	**16,500**	**246,200**
	IC	**12,000**	.....	.....	.....	.....	.....	.....
	Total	**548,397**	.....	**16,500**	**163,200**	**50,000**	**16,500**	**246,200**
Cooperatives								
Colorado-Ute Electric	Steam	75,900	37,950	.....	.....	.....	.....	.....

Mountain (continued)

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Moon Lake Electric Ass'n.	Hydro	900	.....	.....	.....	.....	.....	.....
	Steam	2,000	.....	.....	.....	.....	.....	.....
	IC	15,464	9,900	.....	.....	.....	.....	.....
	Total	18,364	9,900	.....	.....	.....	.....	.....
Northern Lights	Hydro	.....	.....	.....	500	4,500	.....	5,000
Plains Electric G & T	Steam	49,500	16,500	.....	33,000	.....	.....	33,000
Total	**Hydro**	**900**	.....	.....	**500**	**4,500**	.....	**5,000**
	Steam	**127,400**	**54,450**	.....	**33,000**	.....	.....	**33,000**
	IC	**15,464**	**9,900**	.....	.....	.....	.....	.....
	Total	**143,764**	**64,350**	.....	**33,500**	**4,500**	.....	**38,000**
Federal Agencies								
Bureau of Reclamation	Hydro	2,474,600	4,500	48,000	95,000	13,500	1,784,100	1,940,600
Corps of Engineers	Hydro	127,600	.....	.....	80,000	.....	.....	80,000
Total	**Hydro**	**2,602,200**	**4,500**	**48,000**	**175,000**	**13,500**	**1,784,100**	**2,020,600**
Mountain Total All Agencies	**Hydro**	**3,623,577**	**117,000**	**48,000**	**393,500**	**18,000**	**2,184,100**	**2,643,600**
	Steam	**2,906,625**	**191,450**	**413,500**	**262,200**	**555,000**	**950,150**	**2,180,850**
	IC	**64,434**	**10,900**	**13,500**	**12,000**	**20,000**	.....	**45,500**
	Total	**6,594,636**	**319,350**	**475,000**	**667,700**	**593,000**	**3,134,250**	**4,869,950**

Pacific

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
California Electric Power	Hydro	87,570	.....	.....	.....	.....	.....	.....
	Steam	335,000	75,000	.....	62,000	.....	62,000	124,000
	Total	422,570	75,000	.....	62,000	.....	62,000	124,000
California Oregon Power	Hydro	398,750	.....	.....	.....	80,000	172,000	252,000
	IC	200	.....	.....	.....	.....	.....	.....
	Total	398,950	.....	.....	.....	80,000	172,000	252,000
Pacific G & E	Hydro	1,922,500	.....	.....	.....	42,000	.....	42,000
	Steam	3,296,500	.....	337,500	325,000	60,000	.....	722,500
	Total	5,219,000	.....	337,500	325,000	102,000	.....	764,500
Pacific P & L	Hydro	484,426	.....	.....	.....	.....	.....	.....
	Steam	294,470	106,000	106,000	.....	.....	.....	106,000
	IC	5,900	.....	.....	.....	.....	.....	.....
	Total	784,796	106,000	106,000	.....	.....	.....	106,000

Pacific (continued)

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Tacoma, Wash.	Hydro	238,000	.....	.....	.....	120,000	340,000	460,000
	Steam	59,000	.....	.....	.....	.....	.....	.....
	Total	297,000	.....	.....	.....	120,000	340,000	460,000
Turlock Irrigation District	Hydro	25,000	.....	.....	.....	.....	65,000	65,000
Total	**Hydro**	**2,165,356**	**160,000**	**898,500**	**642,000**	**502,500**	**1,903,750**	**3,946,750**
	Steam	**1,564,000**	**204,000**	**44,000**	.....	**230,000**	**340,000**	**614,000**
	Total	**3,729,356**	**364,000**	**942,500**	**642,000**	**732,500**	**2,243,750**	**4,560,750**
Federal Agencies								
Bureau of Reclamation	Hydro	2,642,750	16,000	.....	.....	.....	369,850	369,850
Corps of Engineers	Hydro	3,582,400	312,000	312,000	325,000	.....	4,192,000	4,829,000
Total	**Hydro**	**6,225,150**	**328,000**	**312,000**	**325,000**	.....	**4,561,850**	**5,198,850**
Pacific	**Hydro**	**13,403,522**	**834,400**	**1,484,500**	**967,000**	**624,500**	**6,877,600**	**9,953,600**
Total All Agencies	**Steam**	**8,953,020**	**815,000**	**849,500**	**607,000**	**1,032,000**	**402,000**	**2,890,500**
	IC	**36,100**	.....	.....	.....	.....	.....	.....
	Total	**22,392,642**	**1,649,400**	**2,334,000**	**1,574,000**	**1,656,500**	**7,279,600**	**12,844,100**

Total Contiguous U.S.

Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Hydro	**28,364,497**	**1,545,700**	**1,704,500**	**3,465,750**	**2,074,700**	**12,683,400**	**19,928,350**
Steam	**113,861,876**	**11,934,330**	**11,321,105**	**7,342,200**	**9,276,500**	**10,242,650**	**38,182,455**
IC	**1,021,110**	**62,063**	**66,200**	**102,400**	**71,360**	**35,925**	**275,885**
Total	**143,247,483**	**13,542,093**	**13,091,805**	**10,910,350**	**11,422,560**	**22,961,975**	**58,386,690**

Alaska and Hawaii

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planne
Alaska Electric Light & Power	Hydro	1,600	.....	.....	800	.....	2,500	3,300
	IC	2,500	.....	.....	.....	.....	.....	.....
	Total	4,100	.....	.....	800	.....	2,500	3,300

Pacific (continued)

Power Companies	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Portland General Electric	Hydro	287,300	.....	.....	.....	.....	240,000	240,000
	Steam	88,000	.....	.....	.....	.....	.....	.....
	Total	375,300	.....	.....	.....	.....	240,000	240,000
Puget Sound P & L.	Hydro	272,600	94,400	64,000	.....	.....	.....	64,000
	Steam	85,800	.....	.....	.....	.....	.....	.....
	Total	358,400	94,400	64,000	.....	.....	.....	64,000
San Diego G & E.	Steam	581,000	.....	142,000	.....	142,000	.....	284,000
Southern California Edison	Hydro	953,220	.....	126,000	.....	.....	.....	126,000
	Steam	2,708,250	430,000	220,000	220,000	600,000	.....	1,040,000
	IC	30,000	.....	.....	.....	.....	.....	.....
	Total	3,691,470	430,000	346,000	220,000	600,000	.....	1,166,000
Washington Water Power	Hydro	606,650	252,000	84,000	.....	.....	.....	84,000
Total	**Hydro**	**5,013,016**	**346,400**	**274,000**	.....	**122,000**	**412,000**	**808,000**
	Steam	**7,389,020**	**611,000**	**805,500**	**607,000**	**802,000**	**62,000**	**2,276,500**
	IC	**36,100**	.....	.....	.....	.....	.....	.....
	Total	**12,438,136**	**957,400**	**1,079,500**	**607,000**	**924,000**	**474,000**	**3,084,500**
Municipal, State and Power District Systems								
Burbank, Calif....	Hydro	5,000	.....	.....	.....	.....	.....	.....
	Steam	114,000	44,000	.....	.....	.....	66,000	66,000
	Total	119,000	44,000	.....	.....	.....	66,000	66,000
Eugene, Oregon..	Hydro	22,800	.....	.....	.....	90,000	.....	90,000
	Steam	25,000	.....	.....	.....	.....	.....	.....
	Total	47,800	.....	.....	.....	90,000	.....	90,000
Glendale, Calif...	Steam	60,000	.....	44,000	.....	.....	44,000	88,000
Hetch Hetchy Water Supply & Power Project	Hydro	73,600	.....	135,000	.....	.....	67,500	202,500
Los Angeles, Calif.	Hydro	737,000	.....	.....	.....	.....	.....	.....
	Steam	1,255,000	160,000	.....	.....	230,000	230,000	460,000
	Total	1,992,000	160,000	.....	.....	230,000	230,000	460,000
P. U. D. No. 1 of Chelan County, Wash.	Hydro	262,300	.....	.....	642,000	107,000	.....	749,000
P. U. D. No. 2 of Grant County	Hydro	160,000	160,000	640,000	.....	.....	831,250	1,471,250
Sacramento, Calif.	Hydro	.....	.....	66,500	.....	185,500	.....	252,000
Seattle, Wash....	Hydro	641,656	.....	57,000	.....	.....	600,000	657,000
	Steam	51,000	.....	.....	.....	.....	.....	.....
	Total	692,656	.....	57,000	.....	.....	600,000	657,000

Alaska and Hawaii

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Ketchikan Public Utilities	Hydro	9,160	.....	4,000	.....	.....	.....	4,000
	IC	825	.....	.....	.....	.....	.....	.....
	Total	9,985	.....	4,000	.....	.....	.....	4,000
Kodiak Electric Ass'n...	IC	3,213	800	.....	.....	.....	.....	.....
Hawaiian Electric Co...	Steam	337,500	60,000	.....	60,000	.....	90,000	150,000
Hilo Electric Light Co...	Hydro	3,400	.....	.....	.....	.....	.....	.....
	Steam	23,425	.....	.....	.....	.....	.....	.....
	IC	7,750	.....	.....	5,000	.....	.....	5,000
	Total	34,575	.....	.....	5,000	.....	.....	5,000
Total	**Hydro**	**14,160**	.....	**4,000**	**800**	.....	**2,500**	**7,300**
	Steam	**360,925**	**60,000**	.....	**60,000**	.....	**90,000**	**150,000**
	IC	**14,288**	**800**	.....	**5,000**	.....	.....	**5,000**
	Total	**389,373**	**60,800**	**4,000**	**65,800**	.....	**92,500**	**162,300**

Total United States

Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Hydro	**28,378,657**	**1,545,700**	**1,708,500**	**3,466,550**	**2,074,700**	**12,685,900**	**19,935,650**
Steam	**114,222,801**	**11,994,330**	**11,321,105**	**7,402,200**	**9,276,500**	**10,332,650**	**38,332,455**
IC	**1,035,398**	**62,863**	**66,200**	**107,400**	**71,360**	**35,925**	**280,885**
Total	**143,636,856**	**13,602,893**	**13,095,805**	**10,976,150**	**11,422,560**	**230,54,475**	**58,548,990**

U.S. Possessions

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Puerto Rico Water Resources Authority	Hydro	107,920	.....	.....	.....	.....	.....	.....
	Steam	296,000	88,000	165,000	.....	82,500	495,000	742,500
	IC	.....	.....	40,000	.....	.....	.....	40,000
	Total	403,920	88,000	205,000	.....	82,500	495,000	782,500
Virgin Islands Corp.....	IC	8,434	1,000	2,500	5,000	.....	.....	7,500
Total	**Hydro**	**107,920**	.....	.....	.....	.....	.....	.....
	Steam	**296,000**	**88,000**	**165,000**	.....	**82,500**	**495,000**	**742,500**
	IC	**8,434**	**1,000**	**42,500**	**5,000**	.....	.....	**47,500**
	Total	**412,354**	**89,000**	**207,000**	**5,000**	**82,500**	**495,000**	**790,000**

Canada

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Aluminum Company of Canada	Hydro	2,964,000	495,000	330,000	.....	.....	132,000	462,000
British Columbia Electric Co	Hydro	993,280	130,500	150,500	.....	.....	.....	150,500
	Steam	.....	.....	.....	180,000	180,000	180,000	540,000
	IC	123,015	120,810	.....	.....	.....	.....	.....
	Total	1,116,295	251,310	150,500	180,000	180,000	180,000	690,500
British Columbia Power Commission	Hydro	302,700	25,000	.....	.....	.....	93,000	93,000
	IC	149,500	46,800	16,900	6,400	9,000	18,300	50,600
	Total	452,200	71,800	16,900	6,400	9,000	111,300	143,600
Calgary Power Ltd...	Hydro	240,000	.....	80,000	.....	.....	150,000	230,000
	Steam	144,000	.....	.....	.....	150,000	.....	150,000
	Total	384,000	.....	80,000	.....	150,000	150,000	380,000
Canadian Utilities Ltd.	Steam	75,000	.....	.....	.....	.....	40,000	40,000
	IC	33,600	600	.....	35,000	.....	.....	35,000
	Total	108,600	600	.....	35,000	.....	40,000	75,000
Churchill River Power Co	Hydro	108,000	18,000	.....	.....	.....	.....	.....
Edmundston, New Brunswick	Hydro	1,375	.....	.....	.....	.....	.....	.....
	IC	3,800	.....	.....	3,850	.....	.....	3,850
	Total	5,175	.....	.....	3,850	.....	.....	3,850
Great Lakes Power Corp	Hydro	183,994	22,222	.....	.....	15,000	10,000	25,000
Hydro-Electric Power Commission of Ontario	Hydro	5,456,821	636,500	22,500	114,500	.....	92,000	229,000
	Steam	935,116	235,000	705,000	376,500	353,000	928,000	2,362,500
	IC	2,281	.....	.....	.....	.....	.....	.....
	Total	6,394,218	871,500	727,500	491,000	353,000	1,020,000	2,591,500
Lethbridge, Alberta...	Steam	14,860	.....	.....	.....	.....	.....	.....
	IC	12,500	.....	12,500	.....	.....	.....	12,500
	Total	27,360	.....	12,500	.....	.....	.....	12,500
Lower St. Lawrence Power	Hydro	13,000	.....	.....	.....	.....	.....	.....
	IC	7,500	2,500	.....	.....	.....	.....	.....
	Total	20,500	2,500	.....	.....	.....	.....	.....
Manitoba Hydro-Electric Board	Hydro	482,000	.....	75,000	75,000	37,500	182,000	369,500
	Steam	132,000	66,000	132,000	.....	.....	.....	132,000
	Total	614,000	66,000	207,000	75,000	37,500	182,000	501,500
Manitoba Power Commission	IC	4,400	1,250	.....	.....	.....	.....	.....
Maritime Electric Co..	Steam	25,321	.....	10,000	.....	.....	.....	10,000
Medicine Hat, Alberta.	IC	17,500	.....	.....	.....	.....	20,000	20,000
New Brunswick Electric Power Commission	Hydro	116,600	.....	.....	.....	.....	36,000	36,000
	Steam	116,700	.....	.....	50,000	.....	.....	50,000
	IC	1,360	.....	.....	.....	.....	.....	.....
	Total	234,660	.....	.....	50,000	.....	36,000	86,000
Newfoundland Light & Power Co	Hydro	58,000	.....	.....	.....	.....	.....	.....
	Steam	35,000	23,000	.....	.....	.....	.....	.....
	IC	2,500	.....	.....	3,000	.....	.....	3,000
	Total	95,500	23,000	.....	3,000	.....	.....	3,000
Northern British Columbia Power Co	Hydro	7,900	.....	6,000	.....	.....	10,000	16,000
	Steam	1,000	.....	.....	.....	.....	.....	.....
	IC	7,700	2,580	.....	.....	2,580	.....	2,580
	Total	16,600	2,580	6,000	.....	2,580	10,000	18,580
Northern Canada Power Commission	Hydro	26,400	.....	7,000	.....	.....	.....	7,000
	Steam	750	.....	750	.....	.....	.....	750
	IC	4,545	1,700	1,200	1,200	1,200	.....	3,600
	Total	31,695	1,700	8,950	1,200	1,200	.....	11,350
Nova Scotia Light & Power Co	Hydro	51,651	.....	.....	.....	6,000	7,000	13,000
	Steam	194,852	58,235	.....	.....	.....	.....	.....
	IC	2,400	.....	.....	.....	.....	.....	.....
	Total	248,903	58,235	.....	.....	6,000	7,000	13,000
Nova Scotia Power Commission	Hydro	95,725	.....	17,500	.....	.....	80,500	98,000
	Steam	75,000	25,000	.....	.....	.....	.....	.....
	IC	1,847	.....	.....	.....	.....	.....	.....
	Total	172,572	25,000	17,500	.....	.....	80,500	98,000
Quebec Hydro-Electric Commission	Hydro	2,709,000	498,000	275,000	.....	135,000	495,000	905,000
Regina, Saskatchewan	Steam	85,000	.....	.....	.....	.....	.....	.....
	IC	.....	.....	20,000	.....	.....	.....	20,000
	Total	85,000	.....	20,000	.....	.....	.....	20,000
Saskatchewan Power Corp	Hydro	.....	.....	.....	.....	.....	200,000	200,000
	Steam	401,000	132,000	66,000	.....	.....	.....	66,000
	IC	54,000	.....	.....	.....	.....	.....	.....
	Total	455,000	132,000	66,000	.....	.....	200,000	266,000
Shawinigan Water & Power Co	Hydro	1,806,000	90,000	.....	.....	.....	310,000	310,000
Strathroy, Ontario....	Hydro	6,050	650	350	350	500	.....	1,200
United Towns Electric Co	Hydro	22,000	4,500	1,200	.....	.....	.....	1,200
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	24,000	4,500	1,200	.....	.....	.....	1,200
Total	**Hydro**	**15,644,496**	**1,920,372**	**965,050**	**189,850**	**194,000**	**1,797,500**	**3,146,400**
	Steam	**2,235,599**	**539,235**	**913,750**	**606,500**	**683,000**	**1,148,000**	**3,351,250**
	IC	**430,448**	**176,240**	**50,600**	**49,450**	**12,780**	**38,300**	**151,130**
	Total	**18,310,543**	**2,635,847**	**1,929,400**	**845,800**	**889,780**	**2,983,800**	**4,648,780**

General Electric turbine design engineers: R. Sheppard, J. E. Downs and E. H. Miller

NOW BEING BUILT FOR NORTHERN INDIANA PUBLIC SERVICE COMPANY

First Pre-Engineered Tandem-Compound, Double-Flow, Reheat Steam Turbine, With New 29-Inch Last-Stage Buckets

General Electric's new 29-inch, last-stage bucket now makes it practical to advance the design of the well-established 3600-rpm, tandem-compound, double-flow, reheat steam turbine to the 175,000-225,000-kw range. The first application of this pre-engineered turbine is now being built for the Baileytown Generating Station*, Northern Indiana Public Service Company.

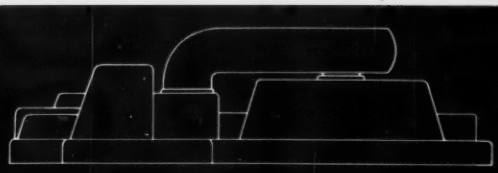
This new bucket design helps improve turbine heat rate and increases power without increasing turbine size or complexity. Inherent G-E bucket standards – high efficiency, low-vibration characteristics, long-life qualities are maintained. Further characteristics of this advance are:

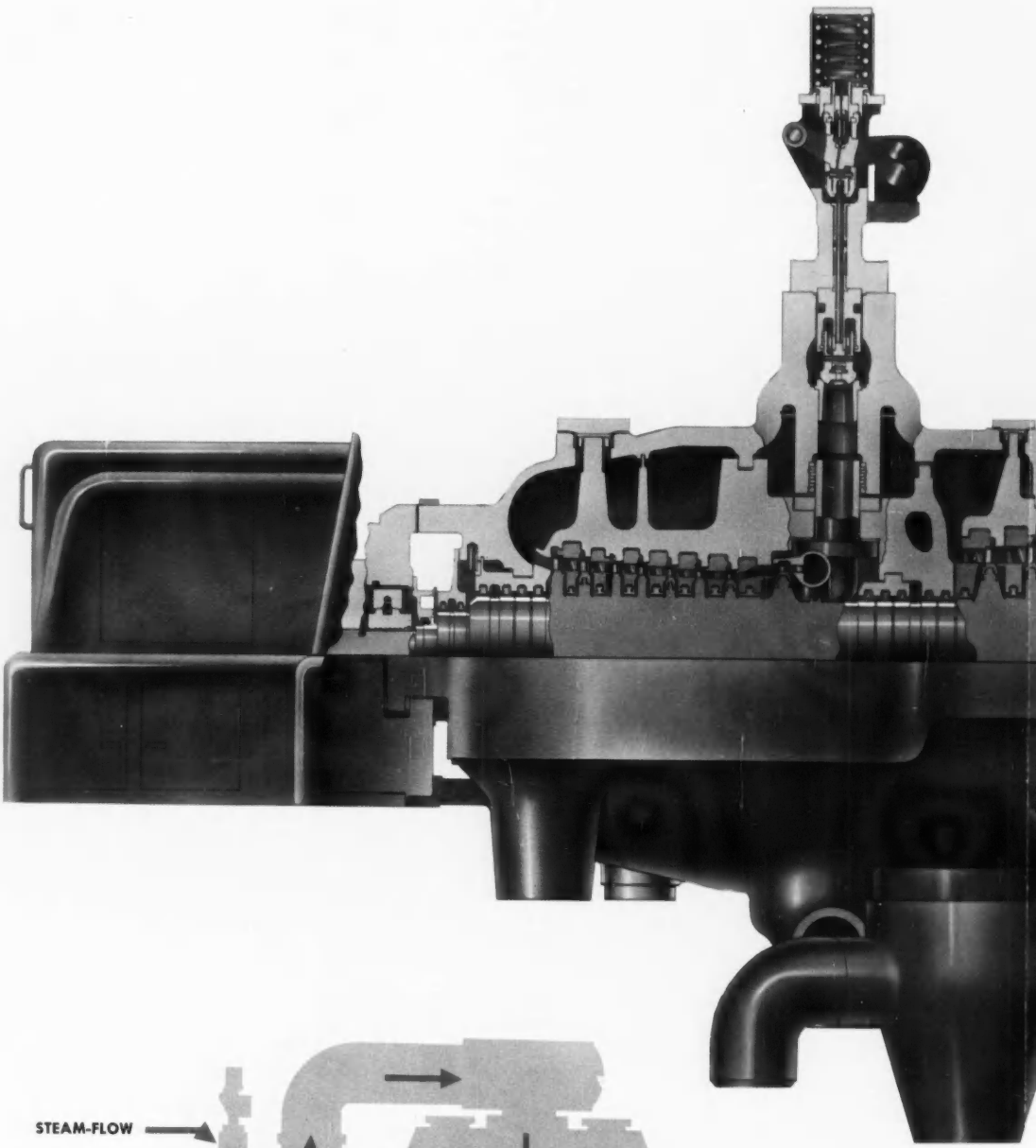
- increased annulus area over the previously longest 3600-rpm, last-stage bucket;
- efficient aerodynamic profile;
- rugged, nested pin-and-finger dovetail construction; and
- improved bucket material.

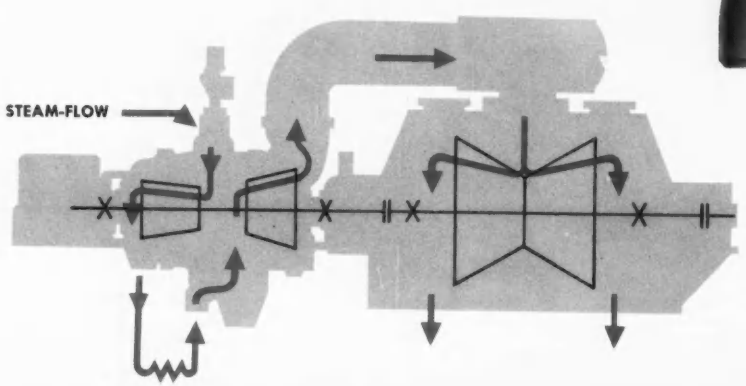
Station designed by: Sargent & Lundy Engineers

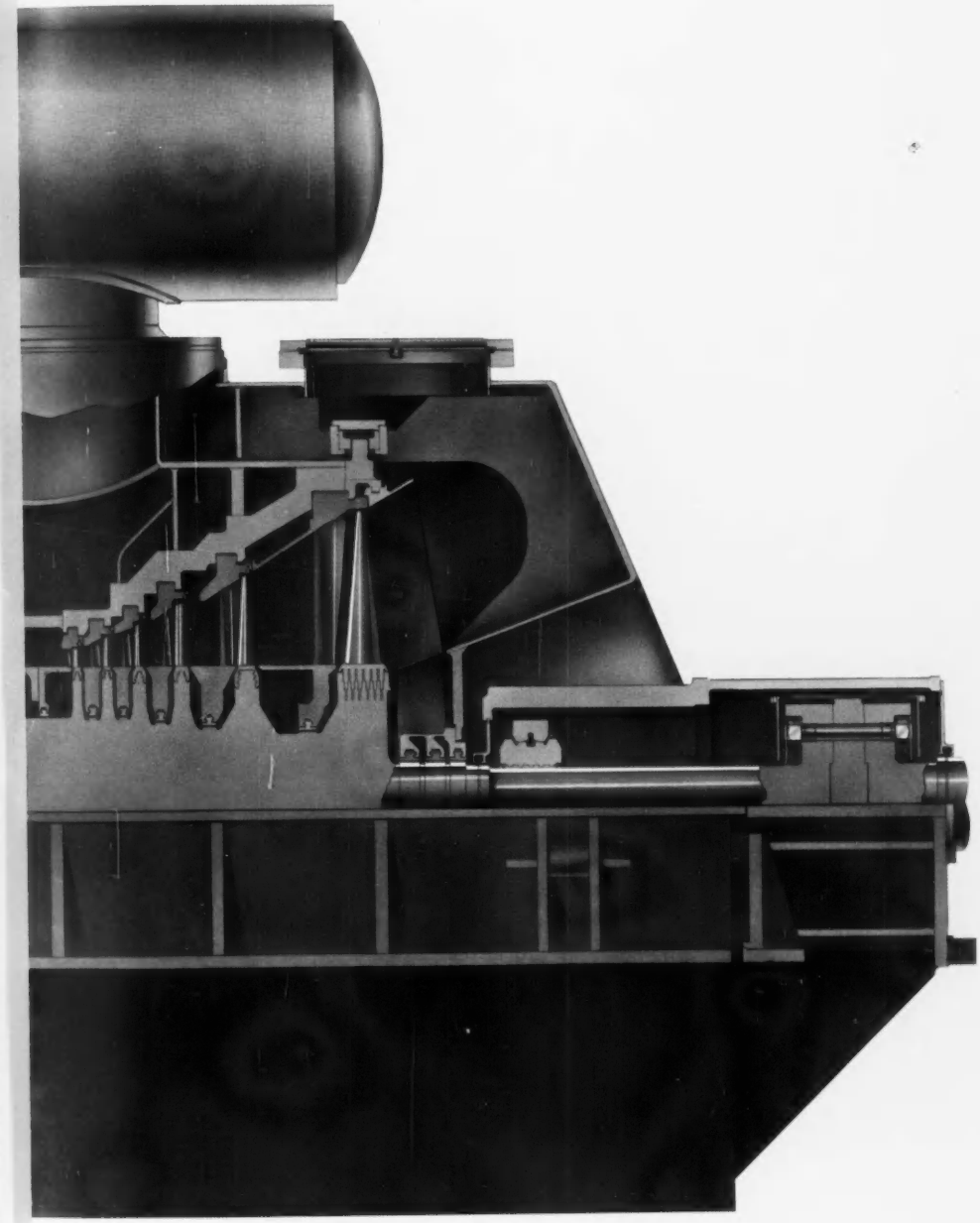
GENERAL ELECTRIC

Profitable Power
from
General Electric
Turbine-Generators



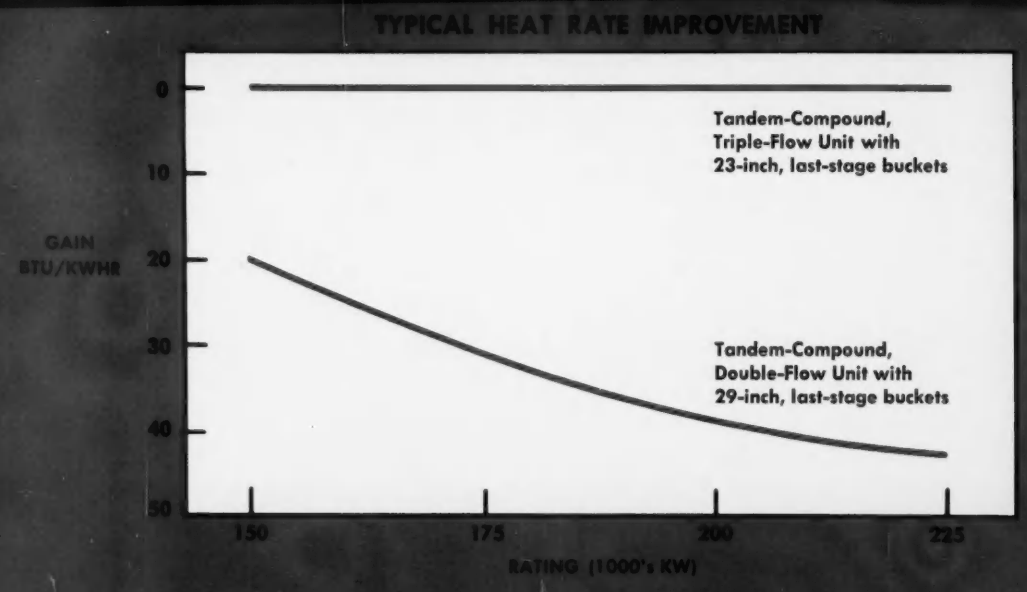


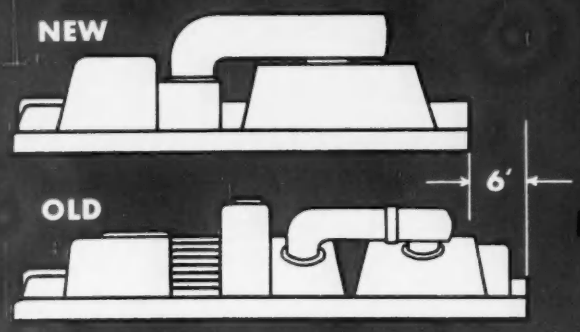

STEAM-FLOW



3600-rpm, tandem-compound,
double-flow, reheat steam turbine

GENERAL ELECTRIC





MORE POWER, LESS SPACE, IMPROVED ECONOMY

Simplified Design Helps Improve Turbine Economy for the '60's

Inherent simplicity and ruggedness of construction have helped establish the basic double-flow design as a standard concept. Now General Electric's newly designed 3600-rpm, tandem-compound, double-flow, reheat steam turbine, with 29-inch, last-stage buckets – in addition to being more compact with improved heat rate – is adding emphasis to:

- **Smoother operation**—two bearings per rotor span allowing independent balancing, vibration isolation between spans, and shorter front standard;
- **Reliability**—intercept valves close to reheat inlets for controlled overspeed, thrust bearing in middle bearing housing for better balance of bucket-to-nozzle clearances;
- **Accessibility**—one-piece lower and upper half-shell construction, single crossover;
- **Ease of assembly and disassembly**—one less turbine rotor, one less cast steel shell, fewer bearings, packings, and couplings.

This is another of General Electric's pre-engineered turbines for the '60's – turbines which can help you meet ever-increasing power demands. For more information on any of General Electric's large steam turbine-generators, contact your nearest General Electric Apparatus Sales Office. 254-87

GENERAL ELECTRIC

General Electric turbine design engineers: R. Sheppard, J. E. Downs and E. H. Miller

NOW BEING BUILT FOR NORTHERN INDIANA PUBLIC SERVICE COMPANY

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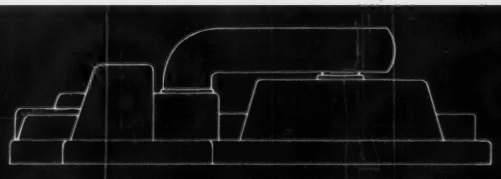
Station designed by: Sargent & Lundy Engineers

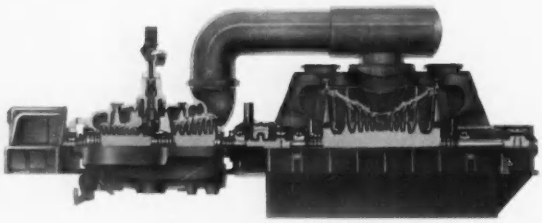
GENERAL ELECTRIC

Profitable Power from General Electric Turbine-Generators

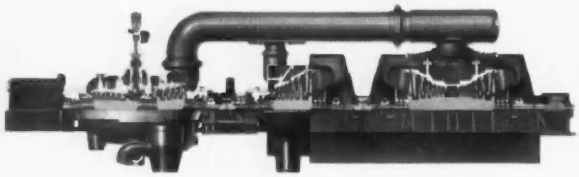


General Electric Pre-Engineered Steam Turbines

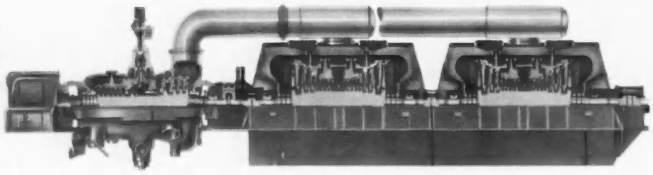
THAT CAN BE ADAPTED TO YOUR SPECIFIC LOAD REQUIREMENTS



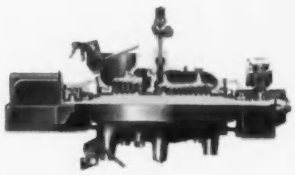
3600-rpm, tandem-compound, double-flow, reheat steam turbine

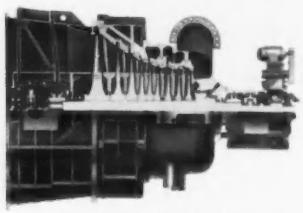


3600-rpm, tandem-compound, triple-flow, reheat steam turbine

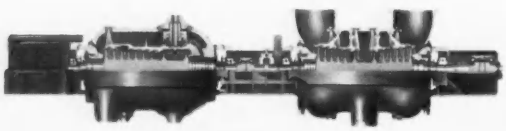


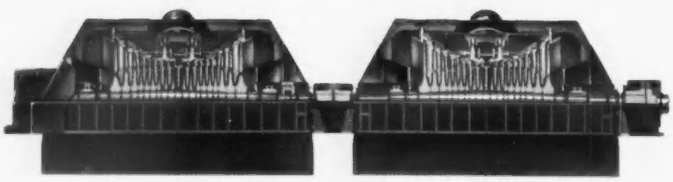
3600-rpm, tandem-compound, four-flow, reheat steam turbine





3600/1800-rpm, cross-compound, single-flow, reheat steam turbine





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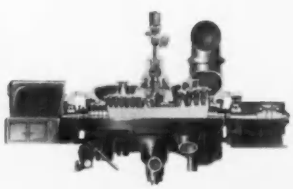

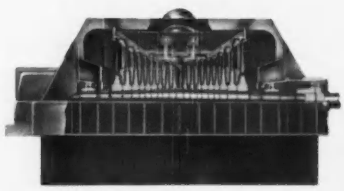

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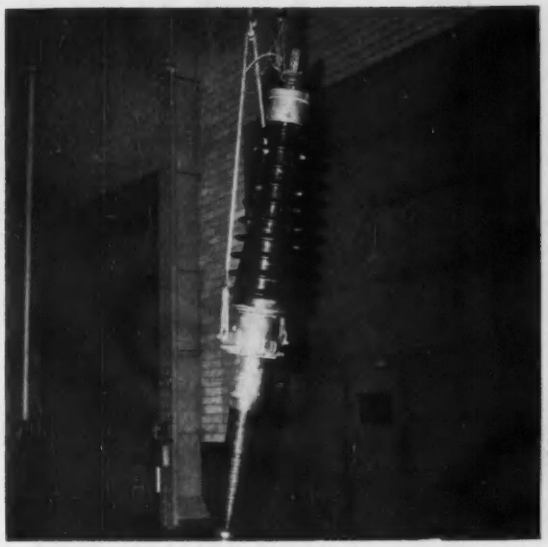
Progress Is Our Most Important Product

GENERAL ELECTRIC



Special Clamp Eases Bushing Handling

E. D. **NOBLE**, Master Maintenance Man,
C. J. **DOBRANETSKI**, Maintenance Man, Tidd Plant, Ohio Power Co, Brilliant, Ohio

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The new method offers considerable savings in "make ready" time and in actual handling time, estimated at 16 man-hr per job.

The new method entails the use of a 1-in. rope sling, the special support clamp and a ½-in. block and tackle. The rope sling is attached to eye hooks located 180 deg apart on the support clamp, which is fastened to the support-flange section of the bushing by two ⅝-in. bolts. The ½-in. block and tackle, fastened to the top of the bushing, is used to change the bushing from a horizontal to a vertical position.

This is how the special support clamp, used in handling a type 0 transformer bushing, was made. Two pieces of 3x½-in. flat plate steel were bent to the contour of the support-flange section with flange ends about 3-in. long.

Flanged ends were drilled for ½-in. bolt holes at about ¾ to 1 in. from the outside end of the flange. Then eye hooks of 3x1x 6-in. plate steel, with a ¾-in. hole, were welded at the top mid-center of the outside surface of each clamp half. When the clamp is assembled on the bushing, the eye hooks align themselves 180 deg apart. Cost of the support clamp was about $5 for materials and $25 for labor.

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Procurement & Products

PRICES ▶ **Along with the criminal indictments returned by the Philadelphia Grand Jury,** the Justice Department also instituted civil complaints against 13 electrical manufacturers covering all the product groups named in the criminal indictments except fused cutouts.

Besides pleading for defendant companies to cease and desist from any unlawful practices, the civil action, if won by the government, would direct the companies to compile and issue new price lists based on an independent study of their costs and profits.

The civil complaint against manufacturers of power switchgear assemblies and oil and air circuit breakers, if won by the government, would further direct these companies to submit to all awarding authorities to which they have submitted bids since Jan. 1, 1958 a copy of the civil judgment along with copies of their new price lists.

REACTION ▶ **Manufacturers, aware of the Grand Jury probe for many months, have taken steps to review and revamp pricing policies.** In a statement given to Allis-Chalmers employees prior to the indictments, President R. S. Stevenson said, "We will dedicate ourselves to the end that the present situation will never arise again." "Aside from the law violation aspect," Stevenson continued, "we are firmly convinced that if the economy of this country is to remain free as well as progressive, stable as well as dynamic, pricing must be determined by sound, informed management judgment, and customers must be earned by quality products and aggressive salesmanship. Any easier cartel-type methods lead only to stagnation, government regulation or both."

FLY ASH ▶ **More than 12,000 tons of fly ash were used to pave areas** surrounding Philadelphia Electric's new Eddystone Station. The ash was used in the form of "Poz-O-Pac" a patented lime-fly ash aggregate road building material. The patent is held by two Philadelphia Electric employees who back in 1941 were appointed to seek economic methods to dispose of fly ash.

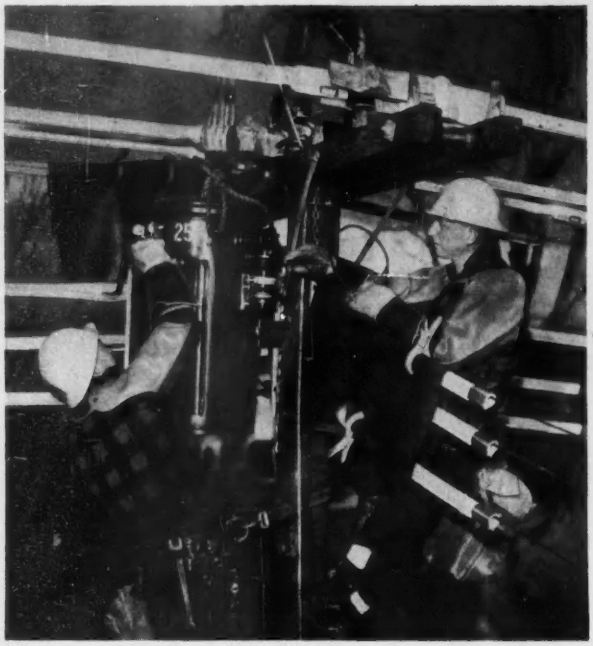
FLEETS ▶ **Compact cars have appeared in utility fleets around the country,** but there's no conclusive evidence yet that they will replace all standard cars. Consolidated Edison is reported to have gone in heavily for Ramblers. Other utilities have bought compacts to test economy claims both as to fuel and maintenance.

SUPPLIERS ▶ **Federal Pacific Electric has begun marketing** Cornell-Dubilier power capacitors for industrial use.

News of Manufacturers ..... page 114
New Equipment ..... page 122
Readers Service ..... page 130

ARE YOU TAKING ADVANTAGE OF THE $ SAVINGS NOW POSSIBLE WITH GENERAL ELECTRIC DISTRIBUTION TRANSFORMERS?

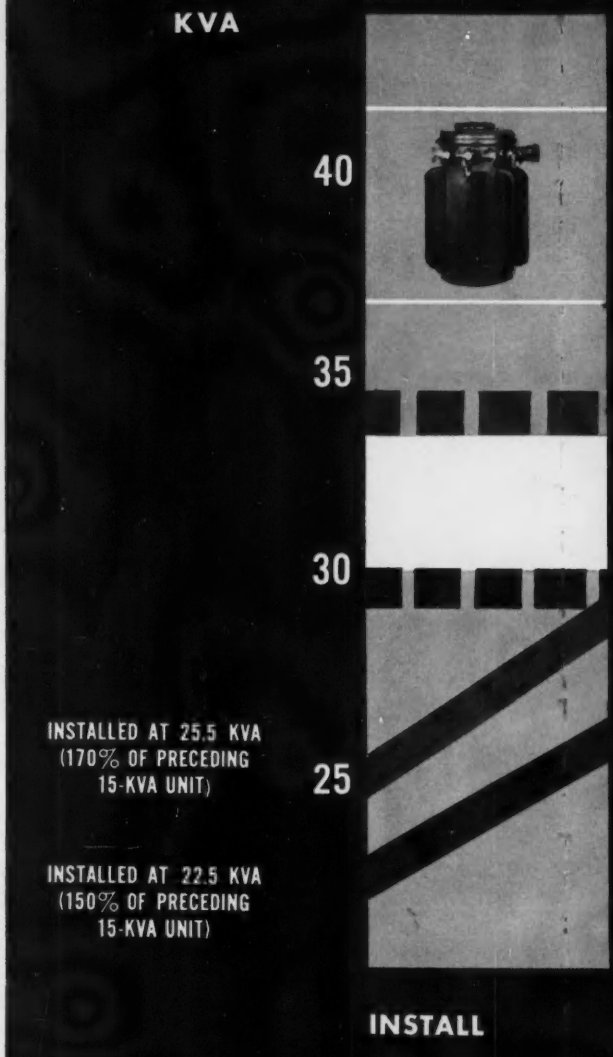
GENERAL ELECTRIC



NEW GENERAL ELECTRIC TRANSFORMER with Permalex* insulation increases loadability by 20 percent with no loss in operating life!

With General Electric Distribution Transformers

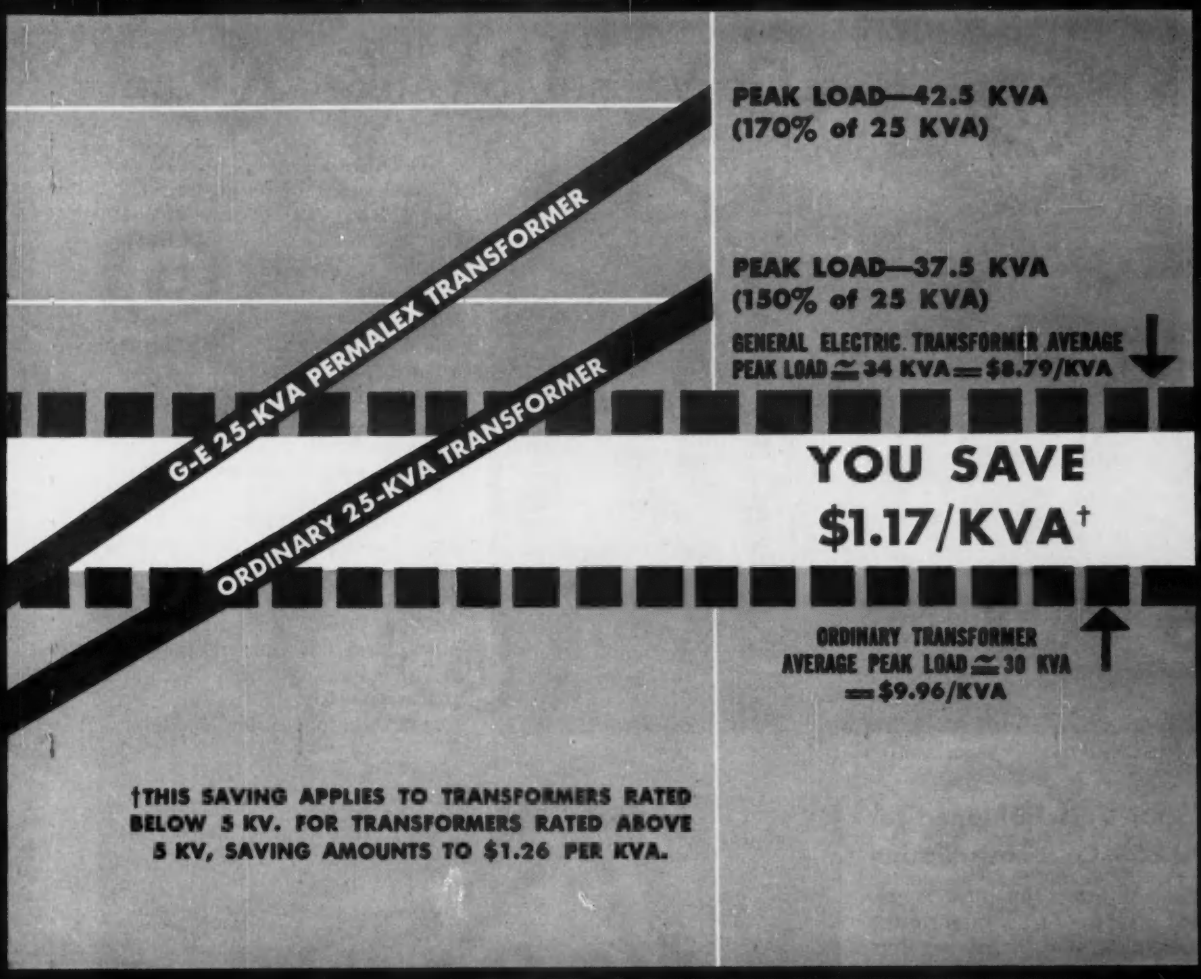
20% Higher Loadability Cuts Transformer Costs Per KVA Of Load Served



New Permalex insulation saves $1.17 per KVA with a 25 KVA transformer.

*Trade-mark of the General Electric Co.

You get these savings with G-E 25-KVA Permalex transformers


PEAK LOAD—42.5 KVA
(170% of 25 KVA)
G-E 25-KVA PERMALEX TRANSFORMER
PEAK LOAD—37.5 KVA
(150% of 25 KVA)
GENERAL ELECTRIC TRANSFORMER AVERAGE
PEAK LOAD ≃ 34 KVA = $8.79/KVA
ORDINARY 25-KVA TRANSFORMER
YOU SAVE
$1.17/KVA†
ORDINARY TRANSFORMER
AVERAGE PEAK LOAD ≃ 30 KVA
= $9.96/KVA
†THIS SAVING APPLIES TO TRANSFORMERS RATED BELOW 5 KV. FOR TRANSFORMERS RATED ABOVE 5 KV, SAVING AMOUNTS TO $1.26 PER KVA.
LOAD SERVED
CHANGE OUT

General Electric's new distribution transformers through 167 kva handle up to 20 percent greater overloads—with full operating life. This added loadability can reduce your transformer investment per kva of load served. Here's why:

On the average, transformers are changed out when peak load reaches 150 percent of rated load. With Permalex insulation in General Electric's new transformers, you can reach 170 percent of rated load before changing out.

As shown in the example above, a 15-kva transformer would normally be changed out when peak load reaches 22.5 kva. A 25-kva unit would then be installed and used until the load increased to 37.5 kva. The average peak load on this ordinary transformer would be 30 kva. Since the net price of a 25 kva, conventional, no tap, transformer below 5 kv is $299, the resultant cost is $9.96 per kva of load served.

With General Electric's 20 percent added loadability, a 15-kva transformer would be used until the peak load reaches *25.5 kva.* A 25-kva unit would then be installed and used until the load reached *42.5 kva,* or 170 percent of rated load. The average peak load of the G-E transformer would then be 34 kva. Again, since the price of the 25-kva transformer is $299, the resultant cost is $8.79 per kva —or a saving of *$1.17 per kva of average peak-load capacity over ordinary transformers.*

Are you taking advantage of this dollar-saving opportunity? For complete information on how you can make Permalex insulation pay off, contact your G-E Sales Engineer, or write for bulletin GEA-6070 to Sect. 431-89A, General Electric Co., Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

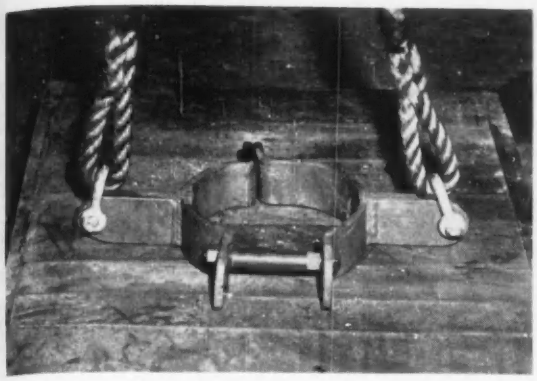
Moor Lake Electric Ass'n	Hydro	
	Steam	2
	IC	15
	Total	18
Northern Lights	Hydro	
Plains Electric G & T	Steam	49
Total	**Hydro**	
	Steam	**127**
	IC	**15**
	Total	**143**
Federal Agencies		
Bureau of Reclamation	Hydro	2,474
Corps of Engineers	Hydro	127
Total	**Hydro**	**2,602**
Mountain Total All Agencies	**Hydro**	**3,623**
	Steam	**2,906**
	IC	**64**
	Total	**6,594**

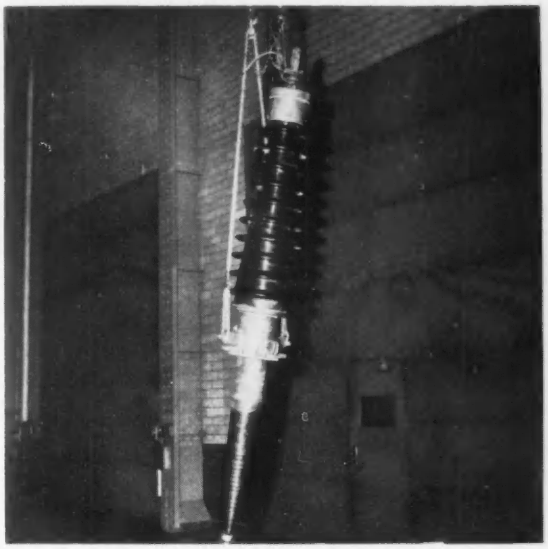
California Electric Power	Hydro	87,570
	Steam	335,000
	Total	422,570
California Oregon Power	Hydro	398,750
	IC	200
	Total	398,950
Pacific G & E	Hydro	1,922,500
	Steam	3,296,500
	Total	5,219,000
Pacific P & L	Hydro	484,426
	Steam	294,470
	IC	5,900
	Total	784,796

Portland General Electric	Hydro	287,300	
	Steam	88,000	
	Total	375,300	
Puget Sound P & L	Hydro	272,600	
	Steam	85,800	
	Total	358,400	
San Diego G & E	Steam	581,000	
Southern California Edison	Hydro	953,220	
	Steam	2,708,250	4
	IC	30,000	
	Total	3,691,470	4
Washington Water Power	Hydro	606,650	2
Total	**Hydro**	**5,013,016**	3
	Steam	**7,389,020**	6
	IC	**36,100**	
	Total	**12,438,136**	9
Municipal, State and Power District Systems			
Burbank, Calif	Hydro	5,000	
	Steam	114,000	
	Total	119,000	
Eugene, Oregon	Hydro	22,800	
	Steam	25,000	
	Total	47,800	
Glendale, Calif	Steam	60,000	
Hetch Hetchy Water Supply & Power Project	Hydro	73,600	
Los Angeles, Calif	Hydro	737,000	
	Steam	1,255,000	1
	Total	1,992,000	1
P. U. D. No. 1 of Chelan County, Wash.	Hydro	262,300	
P. U. D. No. 2 of Grant County	Hydro	160,000	1
Sacramento, Calif	Hydro		
Seattle, Wash	Hydro	641,656	
	Steam	51,000	
	Total	692,656	

Canada

	Prime Mover	Capacity End 1959	1959	1960	1961	1962	After 1962	Total Additions Now Planned
Aluminum Company of Canada	Hydro	2,964,000	495,000	330,000	.....	.....	132,000	462,000
British Columbia Electric Co	Hydro	993,280	130,500	150,500	.....	.....	.....	150,500
	Steam	.....	.....	.....	180,000	180,000	180,000	540,000
	IC	123,015	120,810	.....	.....	.....	.....	.....
	Total	1,116,295	251,310	150,500	180,000	180,000	180,000	690,500
British Columbia Power Commission	Hydro	302,700	25,000	.....	.....	.....	93,000	93,000
	IC	149,500	46,800	16,900	6,400	9,000	18,300	50,600
	Total	452,200	71,800	16,900	6,400	9,000	111,300	143,600
Calgary Power Ltd...	Hydro	240,000	.....	80,000	.....	.....	150,000	230,000
	Steam	144,000	.....	.....	.....	150,000	.....	150,000
	Total	384,000	.....	80,000	.....	150,000	150,000	380,000
Canadian Utilities Ltd.	Steam	75,000	.....	.....	.....	.....	40,000	40,000
	IC	33,600	600	.....	35,000	.....	.....	35,000
	Total	108,600	600	.....	35,000	.....	40,000	75,000
Churchill River Power Co	Hydro	108,000	18,000	.....	.....	.....	.....	.....
Edmundston, New Brunswick	Hydro	1,375	.....	.....	.....	.....	.....	.....
	IC	3,800	.....	.....	3,850	.....	.....	3,850
	Total	5,175	.....	.....	3,850	.....	.....	3,850
Great Lakes Power Corp	Hydro	183,994	22,222	.....	.....	15,000	10,000	25,000
Hydro-Electric Power Commission of Ontario	Hydro	5,456,821	636,500	22,500	114,500	.....	92,000	229,000
	Steam	935,116	235,000	705,000	376,500	353,000	928,000	2,362,500
	IC	2,281	.....	.....	.....	.....	.....	.....
	Total	6,394,218	871,500	727,500	491,000	353,000	1,020,000	2,591,500
Lethbridge, Alberta...	Steam	14,860	.....	.....	.....	.....	.....	.....
	IC	12,500	.....	12,500	.....	.....	.....	12,500
	Total	27,360	.....	12,500	.....	.....	.....	12,500
Lower St. Lawrence Power	Hydro	13,000	.....	.....	.....	.....	.....	.....
	IC	7,500	2,500	.....	.....	.....	.....	.....
	Total	20,500	2,500	.....	.....	.....	.....	.....
Manitoba Hydro-Electric Board	Hydro	482,000	.....	75,000	75,000	37,500	182,000	369,500
	Steam	132,000	66,000	132,000	.....	.....	.....	132,000
	Total	614,000	66,000	207,000	75,000	37,500	182,000	501,500
Manitoba Power Commission	IC	4,400	1,250	.....	.....	.....	.....	.....
Maritime Electric Co..	Steam	25,321	.....	10,000	.....	.....	.....	10,000
Medicine Hat, Alberta.	IC	17,500	.....	.....	.....	.....	20,000	20,000
New Brunswick Electric Power Commission	Hydro	116,600	.....	.....	.....	.....	36,000	36,000
	Steam	116,700	.....	.....	50,000	.....	.....	50,000
	IC	1,360	.....	.....	.....	.....	.....	.....
	Total	234,660	.....	.....	50,000	.....	36,000	86,000
Newfoundland Light & Power Co	Hydro	58,000	.....	.....	.....	.....	.....	.....
	Steam	35,000	23,000	.....	.....	.....	.....	.....
	IC	2,500	.....	.....	3,000	.....	.....	3,000
	Total	95,500	23,000	.....	3,000	.....	.....	3,000
Northern British Columbia Power Co	Hydro	7,900	.....	6,000	.....	.....	10,000	16,000
	Steam	1,000	.....	.....	.....	.....	.....	.....
	IC	7,700	2,580	.....	.....	2,580	.....	2,580
	Total	16,600	2,580	6,000	.....	2,580	10,000	18,580
Northern Canada Power Commission	Hydro	26,400	.....	7,000	.....	.....	.....	7,000
	Steam	750	.....	750	.....	.....	.....	750
	IC	4,545	1,700	1,200	1,200	1,200	.....	3,600
	Total	31,695	1,700	8,950	1,200	1,200	.....	11,350
Nova Scotia Light & Power Co	Hydro	51,651	.....	.....	.....	6,000	7,000	13,000
	Steam	194,852	58,235	.....	.....	.....	.....	.....
	IC	2,400	.....	.....	.....	.....	.....	.....
	Total	248,903	58,235	.....	.....	6,000	7,000	13,000
Nova Scotia Power Commission	Hydro	95,725	.....	17,500	.....	.....	80,500	98,000
	Steam	75,000	25,000	.....	.....	.....	.....	.....
	IC	1,847	.....	.....	.....	.....	.....	.....
	Total	172,572	25,000	17,500	.....	.....	80,500	98,000
Quebec Hydro-Electric Commission	Hydro	2,709,000	498,000	275,000	.....	135,000	495,000	905,000
Regina, Saskatchewan	Steam	85,000	.....	.....	.....	.....	.....	.....
	IC	.....	.....	20,000	.....	.....	.....	20,000
	Total	85,000	.....	20,000	.....	.....	.....	20,000
Saskatchewan Power Corp	Hydro	.....	.....	.....	.....	.....	200,000	200,000
	Steam	401,000	132,000	66,000	.....	.....	.....	66,000
	IC	54,000	.....	.....	.....	.....	.....	.....
	Total	455,000	132,000	66,000	.....	.....	200,000	266,000
Shawinigan Water & Power Co	Hydro	1,806,000	90,000	.....	.....	.....	310,000	310,000
Strathroy, Ontario....	Hydro	6,050	650	350	350	500	.....	1,200
United Towns Electric Co	Hydro	22,000	4,500	1,200	.....	.....	.....	1,200
	IC	2,000	.....	.....	.....	.....	.....	.....
	Total	24,000	4,500	1,200	.....	.....	.....	1,200
Total	**Hydro**	**15,644,496**	**1,920,372**	**965,050**	**189,850**	**194,000**	**1,797,500**	**3,146,400**
	Steam	**2,235,599**	**539,235**	**913,750**	**606,500**	**683,000**	**1,148,000**	**3,351,250**
	IC	**430,448**	**176,240**	**50,600**	**49,450**	**12,780**	**38,300**	**151,130**
	Total	**18,310,543**	**2,635,847**	**1,929,400**	**845,800**	**889,780**	**2,983,800**	**6,648,780**





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PRICES ▶ **Along with the criminal indictments returned by the Philadelphia Grand Jury,** the Justice Department also instituted civil complaints against 13 electrical manufacturers covering all the product groups named in the criminal indictments except fused cutouts.

Besides pleading for defendant companies to cease and desist from any unlawful practices, the civil action, if won by the government, would direct the companies to compile and issue new price lists based on an independent study of their costs and profits.

The civil complaint against manufacturers of power switchgear assemblies and oil and air circuit breakers, if won by the government, would further direct these companies to submit to all awarding authorities to which they have submitted bids since Jan. 1, 1958 a copy of the civil judgment along with copies of their new price lists.

REACTION ▶ **Manufacturers, aware of the Grand Jury probe for many months, have taken steps to review and revamp pricing policies.** In a statement given to Allis-Chalmers employees prior to the indictments, President R. S. Stevenson said, "We will dedicate ourselves to the end that the present situation will never arise again." "Aside from the law violation aspect," Stevenson continued, "we are firmly convinced that if the economy of this country is to remain free as well as progressive, stable as well as dynamic, pricing must be determined by sound, informed management judgment, and customers must be earned by quality products and aggressive salesmanship. Any easier cartel-type methods lead only to stagnation, government regulation or both."

FLY ASH ▶ **More than 12,000 tons of fly ash were used to pave areas** surrounding Philadelphia Electric's new Eddystone Station. The ash was used in the form of "Poz-O-Pac" a patented lime-fly ash aggregate road building material. The patent is held by two Philadelphia Electric employees who back in 1941 were appointed to seek economic methods to dispose of fly ash.

FLEETS ▶ **Compact cars have appeared in utility fleets around the country, but** there's no conclusive evidence yet that they will replace all standard cars. Consolidated Edison is reported to have gone in heavily for Ramblers. Other utilities have bought compacts to test economy claims both as to fuel and maintenance.

SUPPLIERS ▶ **Federal Pacific Electric has begun marketing** Cornell-Dubilier power capacitors for industrial use.

News of Manufacturers ..... page 114
New Equipment ..... page 122
Readers Service ..... page 130

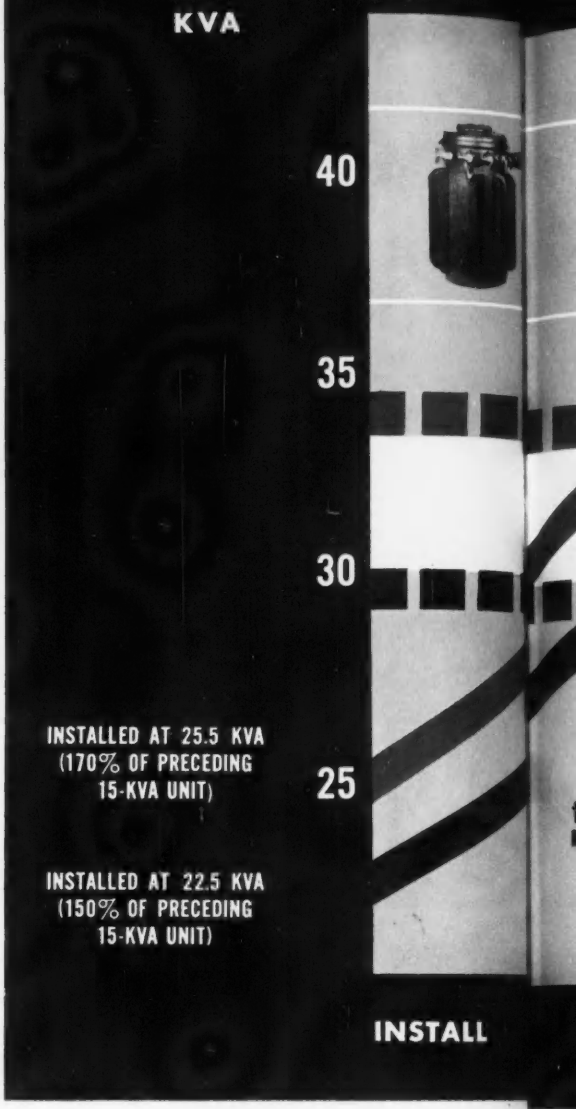
ARE YOU TAKING ADVANTAGE OF THE $ SAVINGS NOW POSSIBLE WITH GENERAL ELECTRIC DISTRIBUTION TRANSFORMERS?

GENERAL ELECTRIC

NEW GENERAL ELECTRIC TRANSFORMER with Permalex* insulation increases loadability by 20 percent with no loss in operating life!

With General Electric Distribution Transformers

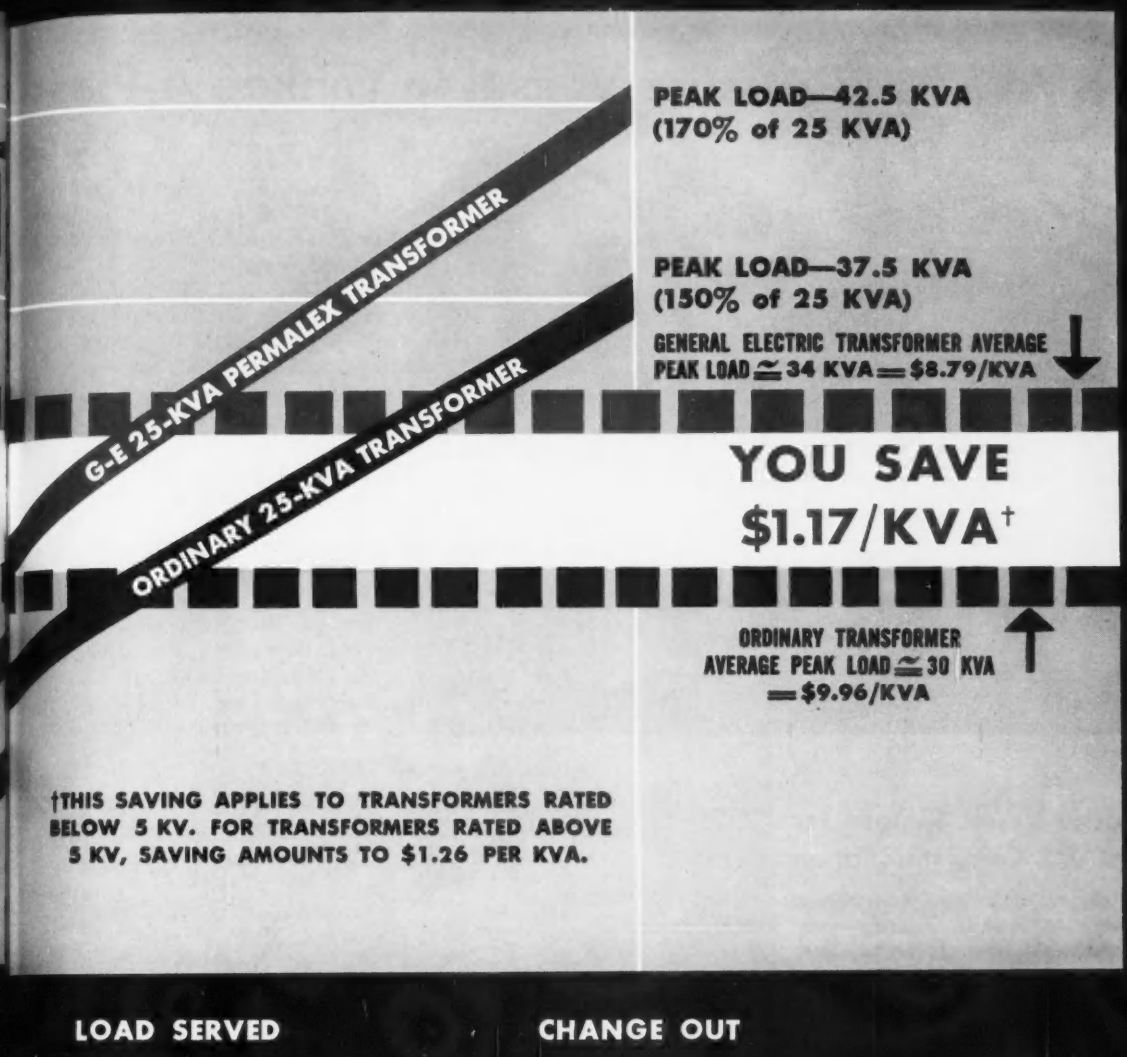
20% Higher Loadability Cuts Transformer Costs Per KVA Of Load Served



New Permalex insulation saves $1.17 per KVA with a 25 KVA transformer.

**Trade-mark of the General Electric Co.*

You get these savings with G-E 25-KVA Permalex transformers


PEAK LOAD—42.5 KVA
(170% of 25 KVA)
G-E 25-KVA PERMALEX TRANSFORMER
PEAK LOAD—37.5 KVA
(150% of 25 KVA)
GENERAL ELECTRIC TRANSFORMER AVERAGE
PEAK LOAD ≃ 34 KVA = $8.79/KVA
ORDINARY 25-KVA TRANSFORMER
YOU SAVE
$1.17/KVA†
ORDINARY TRANSFORMER
AVERAGE PEAK LOAD ≃ 30 KVA
= $9.96/KVA
†THIS SAVING APPLIES TO TRANSFORMERS RATED BELOW 5 KV. FOR TRANSFORMERS RATED ABOVE 5 KV, SAVING AMOUNTS TO $1.26 PER KVA.
LOAD SERVED
CHANGE OUT

General Electric's new distribution transformers through 167 kva handle up to 20 percent greater overloads—with full operating life. This added loadability can reduce your transformer investment per kva of load served. Here's why:

On the average, transformers are changed out when peak load reaches 150 percent of rated load. With Permalex insulation in General Electric's new transformers, you can reach 170 percent of rated load before changing out.

As shown in the example above, a 15-kva transformer would normally be changed out when peak load reaches 22.5 kva. A 25-kva unit would then be installed and used until the load increased to 37.5 kva. The average peak load on this ordinary transformer would be 30 kva. Since the net price of a 25 kva, conventional, no tap, transformer below 5 kv is $299, the resultant cost is $9.96 per kva of load served.

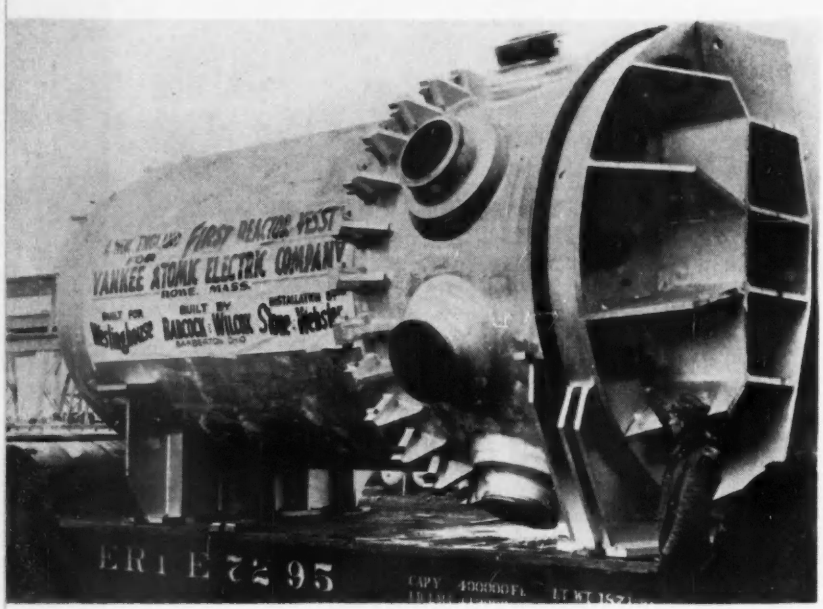
With General Electric's 20 percent added loadability, a 15-kva transformer would be used until the peak load reaches *25.5 kva.* A 25-kva unit would then be installed and used until the load reached *42.5 kva,* or 170 percent of rated load. The average peak load of the G-E transformer would then be 34 kva. Again, since the price of the 25-kva transformer is $299, the resultant cost is $8.79 per kva —or a saving of *$1.17 per kva of average peak-load capacity over ordinary transformers.*

Are you taking advantage of this dollar-saving opportunity? For complete information on how you can make Permalex insulation pay off, contact your G-E Sales Engineer, or write for bulletin GEA-6070 to Sect. 431-89A, General Electric Co., Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

B&W Ships Pressure Vessel to Yankee A-Plant



At Babcock & Wilcox Co's boiler division works in Barberton, Ohio, this 165-ton nuclear reactor vessel (left) is started on its way to Yankee Atomic Electric Co's power site at Rowe, Mass. B&W built it under contract to Westinghouse Electric Corp, designer of the 134-Mw nuclear reactor plant for the generating station. The unit is being conveyed by a specially-built flatcar three times the length of an ordinary one.

Unusual design feature of the vessel consists of the location of eight inlet and outlet nozzles for the reactor primary circulating system. They are at the top. Water enters the reactor above the core level through 20-in. dia stainless steel pipes, flows down around the thermal shield and up through the core. It then travels to the steam generators through four 20-in. outlet pipes.

Reactor Vessel Shipped for First U. S. Co-op Installation

Reactor vessel for first atomic power plant for a U. S. rural electric system (right) starts its journey from Pacific Coast Engineering Co, Alameda, Calif., to the Rural Cooperative Power Association's Elk River power plant in Minn. Allis-Chalmers is building the 22-Mw reactor for the 1,250 psi vessel, designed and constructed by PCE Co.

The vessel is 33 ft long, 7 ft in dia, and has a shell wall 3⅛ in. thick with ⅛-in. stainless steel cladding. It weighs 145,000 lb.

Pole Switch Firm Founded by Three Engineers

Powerdyne, Inc, a new firm formed by three Oregon engineers, began making four pole-top switches, 7.5 to 69-kv, the first of this month in a new factory in Oswego, Ore.

The company's president is Henry H. Schwager, former manager of engineering for Schwager-Wood Corp. Charles E. Kerr, secretary, was formerly in Food Machinery Corp's production engineering division and Clarence C. Bragg, treasurer, formerly of Westinghouse.

GE Receives Contract for 400-Mva Transformer

General Electric will build a 400-Mva, 230-kv power transformer for Public Service Electric & Gas Co's Sewaren generating station. Not only will it be the highest capacity unit of its kind made by the company, but GE believes it will be the highest-rated two-winding unit ever built or on order in the U. S.

GE's largest such units were two 375-Mva power transformers. N. E. Dillow, manager of power transformer engineering, points out that

(*Continued on page* 118)

ANOTHER STEP AHEAD IN VOLTAGE REGULATION

APPLICATION ENGINEERING

These General Electric Voltage Regulator

SERVICES MEAN SAVINGS

INSTALLATION SERVICE

LINE CREW TRAINING

RAPID PARTS SHIPMENT

Savings for you through economical application, installation, operation, and maintenance are a big part of General Electric's voltage regulator story.

When you buy reliable G-E regulators you receive these added values in service:

- Engineering assistance during planning stages of modern distribution systems gives you benefits of latest application concepts and computer-augmented system regulation studies.
- Installation guidance on-the-site by G-E regulator engineers assures proper hook-up, continued economical operation.
- Factory trained G-E personnel keep you informed of the latest regulator operation and maintenance techniques to save you money year after year.
- Rapid renewal parts shipment, within 48 hours on common replacement items, cuts outages to a minimum. Nationwide network of G-E service shops stays open 24 hours a day, 7 days a week to give service when you need it—and fast. Quick regulator delivery from *local* G-E warehouses helps you meet storm-caused emergencies.

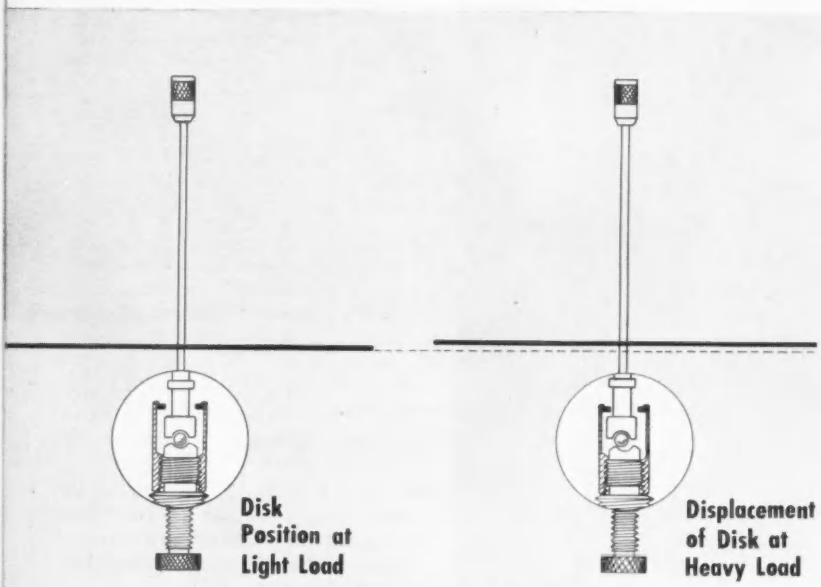
Service that saves you money during planning, installation, and operation is another reason why General Electric regulators cost less on the line! Ask your G-E regulator representative for detailed information. General Electric Company, Schenectady 5, N. Y. 456-01

Progress Is Our Most Important Product

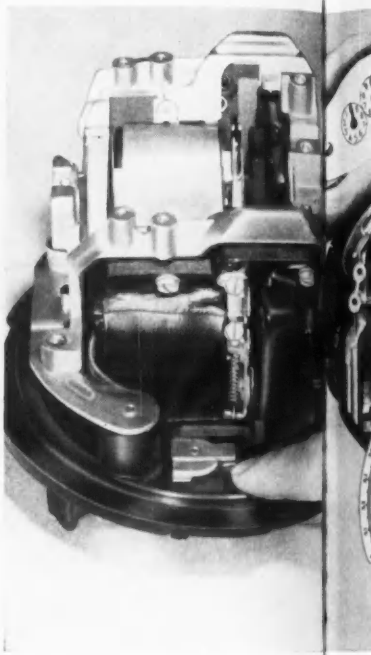
GENERAL ELECTRIC

5 WAYS

Here's Why General Electric's New, Complete V-



OLD-STYLE BALL-BEARING SYSTEM



1 MAGNETIC SUSPENSION ASSURES ACCURACY THROUGH FULL METER RANGE—With conventional ball and jewel bearing system, higher loads can force the disk out of position and cause inaccurate meter readings. Because the disk in General Electric polyphase meters floats free, there's never a danger of disk displacement at any load . . . meter readings are accurate through full meter range.

In addition, because there are no ball bearings in G-E's magnetic suspension system, you eliminate bearing inspection, cleaning and replacement costs. You also minimize revenue losses because this free-floating system reduces friction-caused tilt errors.

2 COORDINATED INSULATION SYSTEM PROVIDES MAXIMUM SURGE PROTECTION—Exclusive series gap design, with magnetic blowout, offers best protection against lightning and other surges. Flashover is controlled and the resulting arcs extinguished within ½-cycle by this unique gap design.

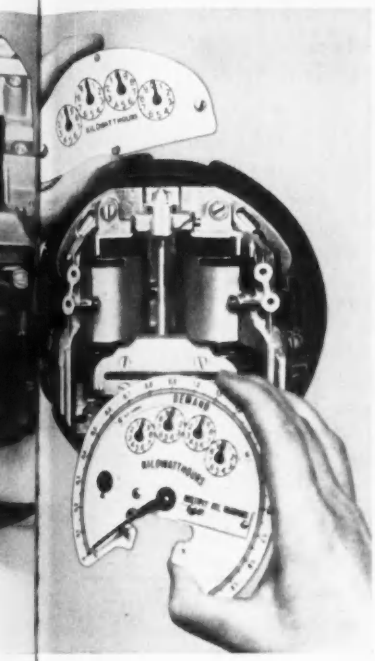
THESE FIVE EXCLUSIVE FEATURES, together with unexcelled load and power factor performance, combine to make the General Electric V-60's your best meter buy.

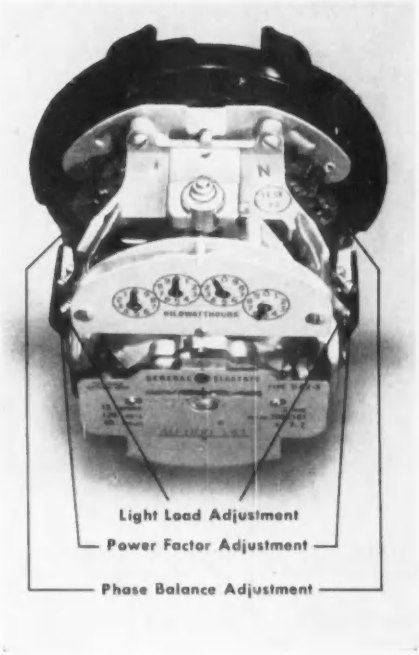
There's a G-E V-60 meter to handle every Class 10, 100 or 200 two-stator polyphase application. Depending upon your needs, specify the V-62 (network and 3-wire, 3-phase), V-63 (3-wire, 3-phase), V-65 (4-wire Y, 3-phase), or the V-66 (4-wire △, 3-phase).

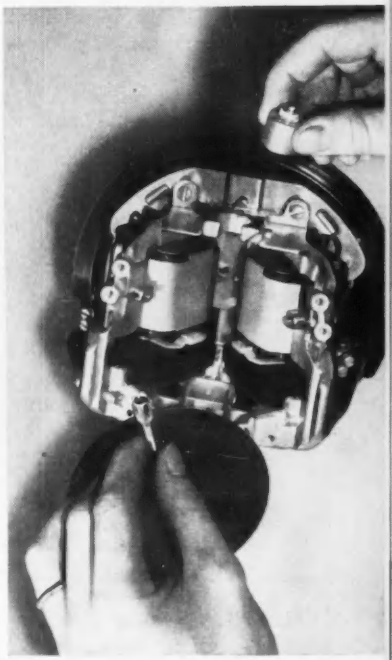
FOR COMPLETE INFORMATION on G-E's new V-60 polyphase meter line, contact your nearest G-E apparatus sales representative or write General Electric Company, Section 628-28, Schenectady 5, N. Y.

BETTER

V-60 Polyphase Meter Line Is Your Best Buy!







3 NEW POLYPHASE METER LINE GIVES YOU GREATER VERSATILITY – V-60 meters accommodate either kilowatt-hour or demand registers without use of adaptors or intermediate gearing. Any G-E demand register manufactured in the last ten years can be used on V-60's as well as on any other G-E meter.

4 ONLY V-60 METERS OFFER COMPLETE, INDIVIDUAL STATOR ADJUSTMENTS—General Electric's advanced V-60 design provides complete vernier adjustments on each stator for all polyphase load conditions. Meters you receive are precisely calibrated for optimum performance. Only one of the light load adjustments is required for normal calibration "touch-up."

5 EXCLUSIVE "V" STATOR DESIGN SIMPLIFIES FIELD MODIFICATION—Because of G-E's unique "V" stator design, disk and shaft assembly can be removed to accommodate contact devices and detents without disassembling meter. Precisely doweled magnet location eliminates need for recalibration.

Progress Is Our Most Important Product

GENERAL ELECTRIC

400-Mva Transformer

(*Continued from page* 114)

inasmuch as GE's largest unit shipped ten years ago was 145-Mva, this represents a significant advance in the move by utilities to install large units to lower installed costs per kva.

A-C Receives Contract for Tuscarora Autotransformers

The 345/230-kv, 400-Mva autotransformers Allis-Chalmers will ship to the Tuscarora power development project early in 1961 will be the largest such units the company has turned out. A-C is also providing twelve reversible pump-turbines for the New York State Power Authority project.

Power will be channeled through the transformers to Niagara Mohawk Power Corp, stepped down to 230 kv, and to Rochester Gas & Electric Corp, stepped down to 115 kv, from the 345-kv level.

As pumps, the Tuscarora units are each rated to deliver 3,400 cu ft of water per second against the storage pond head of 85 ft. As turbines in reverse rotation, they are each rated 28,000 hp under a 75-ft operating head.

Installs Regulators at Paschall

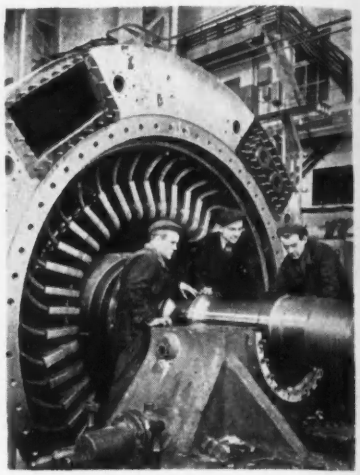
Twenty-seven 100-kva, 2.5-kv Allis-Chalmers single-phase regulators replaced induction type regulators at Philadelphia Electric Co's Paschall substation when the utility switched from two to three-phase service. It was the first large indoor installation of these JFR step-type distribution regulators.

The regulators, connected in wye, arranged in three parallel rows.

Russia Is Now Producing 500-Kv Transformers

Under the U.S.S.R's seven-year plan, production of 500-kv, 135-Mva transformers has gotten underway at the Zaporojski transformer plant. Heaviest transformer of this capacity is 235 tons.

These transformers will be used in groups of three with aggregate capacity of 405 Mva. Time for assembly is described as eight times less than the standard 400-kv transformer, and parts can be removed without use of special cranes.



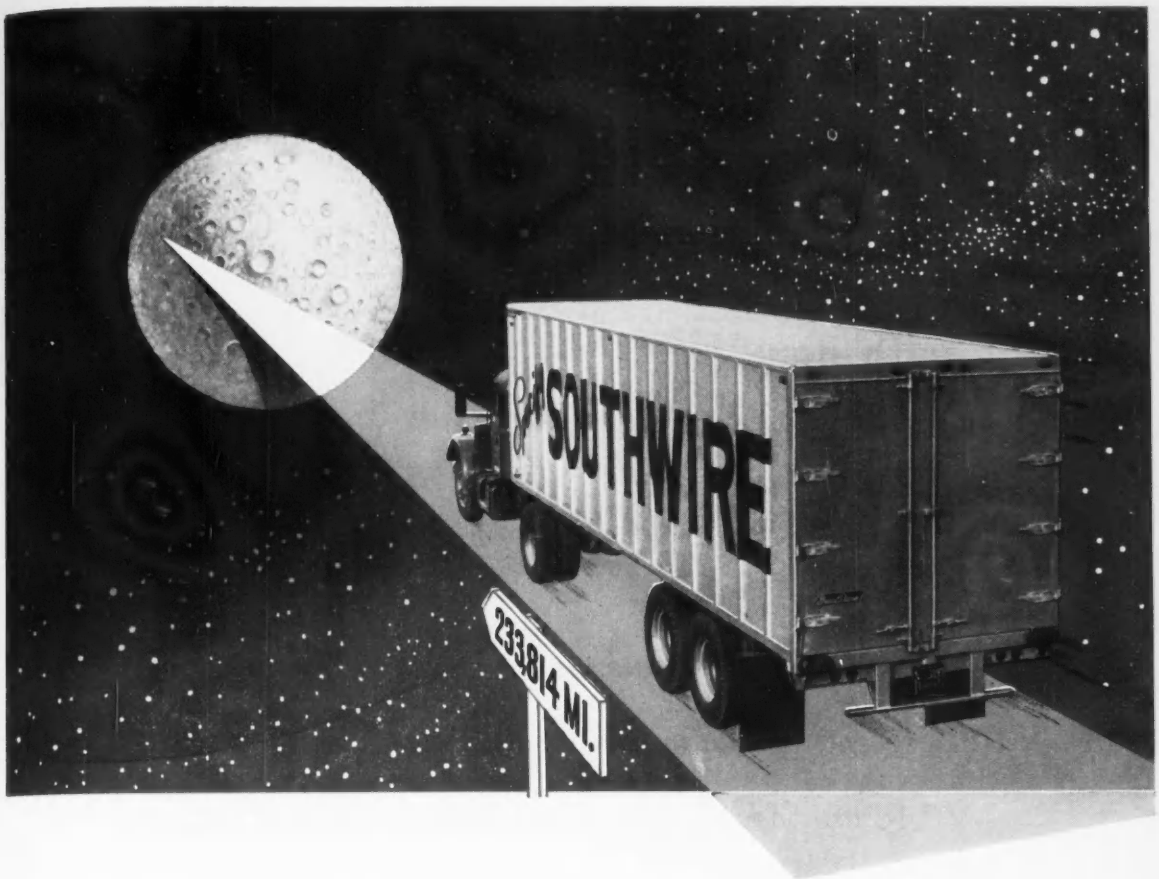
USSR Builds 165-Mw T-G

Russian workmen at the S. M. Kirov plant in Leningrad (above) are producing a 165-Mw turbo-generator which will be installed in the Nazarovski power station. Rotor windings use forced hydrogen cooling; stator windings are water-cooled.

With this cooling system, the weight of the turbo-generator is only 220 tons, compared to 330 tons for an earlier model 150-Mw turbo-generator.

MANUFACTURERS BRIEFS

H. K. Porter will invest about $4-million in new construction and equipment modernization of refractories division plants located at Bessemer, Ala, and Wellsville, Ohio . . . **Bogue Electric Mfg Co's Belco Division,** which specializes in automated water treatment, particularly in the power plant field, will merge sales and engineering resources with those of Head Wrightson & Co, Ltd. The latter is one of England's leading heavy engineering companies. Belco claims to have developed one of the largest fully automatic demineralization systems in the world, and one of the most compact units . . . Compressor manufacturing facilities at the Westinghouse air conditioning division plant at Staunton, Va, have been expanded to include units rated at 20 to 100 tons. This will result in the company's manufacture of larger units such as packaged chillers, condensing units and 40 and 50-ton Unitaires, the company's self-contained, water-cooled air conditioners . . . **Sperry Rand Corp** announces it will construct a new engineering center for the Remington Rand Division. The new facility will be near Ambler, Pa. A large computer center with data-automation systems will be made available to Univac customers and sales personnel . . . **Aluminum Extrusion Co** says important cost savings resulted when cast aluminum bus bar was installed in its Los Angeles plant. Lightweight bus, cast by Kaiser Aluminum & Chemical Corp through its recently perfected K slab process, is used to feed a 7,500-amp anodizing tank. This is one of the first applications of this type of cast bus product. The contractor on the job said cost was about 30% of the cost of copper bus with equivalent current capacity—840 amp per sq in. Installation cost was approximately 65% of the estimated cost for installing copper bus . . . **John Thompson, Ltd,** is manufacturing two coal-fired boilers for 350-Mw steam turbine generators for Central Electric Generating Board's Drakelow C power station near Burton-on-Trent, England. The company says they are the largest single units of this type to be installed. Capability of each of the La Mont forced circulation units is 2,450,000 lb/hr at 2,400 psig and 1,055F at the superheater outlet. Reheat steam flow will be 1,950,000 lb/hr at 589 psig and 1,055F. They have a steam inlet temperature at economizer inlet of 500F. English Electric is making the generators.



We shoot for the moon every month!

The mean distance from the surface of the earth to the surface of the moon is 233,814 miles. Every month Southwire trucks come close to registering that many miles right here on good old terra firma. Our record so far was set at 229,893 miles in December 1959.

Like some others who are shooting for the moon, we haven't made it yet, but that doesn't keep us from trying. Someday soon we'll do it, and then we'll try for the round trip—467,628 miles!

Far-fetched? We think not. It points up Southwire's unwavering aim to produce more and better wire, and better service.

How does anyone reach the moon unless he shoots for it?

Southwire Company

SOUTHWIRE serves the world

Carrollton, Georgia — TErrace 2-6311

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP* (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable
- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

NOW... Pennsylvania doubles the tank protection of Pole Star transformers and regulators with new V.I.P.

V.I.P. *pretreats tank surfaces to resist corrosion*

V.I.P. *prevents spread of rust if scratches occur in handling*

V.I.P. *provides extra-high resistance to moisture, alkali, acids*

V.I.P. *protects against incipient corrosion at edges, corners*

V.I.P. *produces high-gloss finish that long retains its luster*

This is the 5-Step V.I.P. process that provides all-weather, all-climate protection for Pole Star distribution transformers and regulators

The sketch at left illustrates the five-step V.I.P. Finish (vinyl with inner phosphate). Note that it is not just a new paint, but a complete metal-finishing process that assures all-climate, all-weather protection.

1. Shot-blasting with steel grit removes all scale, grease and dirt, and provides "toothage" for adhesion of the first coat to the steel surface.

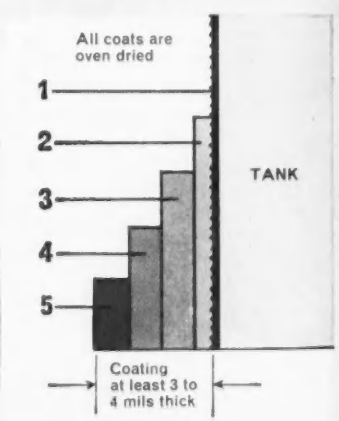
2. A combination chemical pretreatment and primer applied by the flow method simultaneously form a phosphate coat and thin organic film on the clean metal. This is the step that gives V.I.P. its ability to prevent the spread of corrosion, even if the metal is scraped bare in spots.

3. A tough vinyl combined with non-leafing aluminum form an almost impenetrable surface against moisture or moisture vapor. This coat is flowed on.

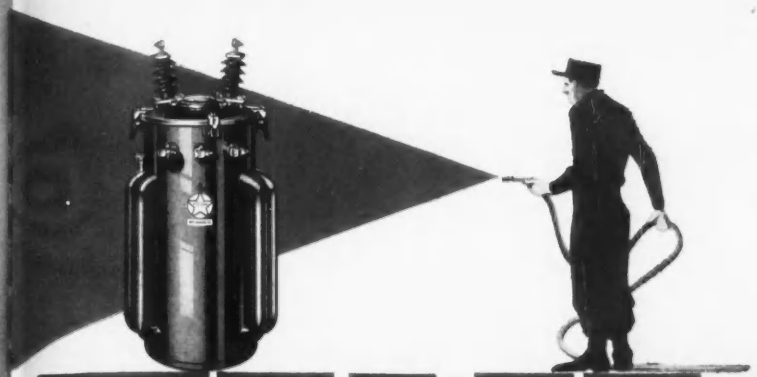
4. An alkyd-titanium paint (used successfully on Pole Star Transformers for many years) is flowed on to provide a heavy, uniform coverage.

5. A final coat of blue-gray alkyd-titanium paint is sprayed on to assure a smooth finish with a maximum gloss. This, together with the preceding coat, forms a hard, elastic finish that resists weathering and does not fade or chalk too quickly.

Total thickness is three to four mils. All coats are oven dried at controlled temperatures.



Pennsylvania POLE STAR Distribution



FINISH*

*Vinyl with Inner Phosphate

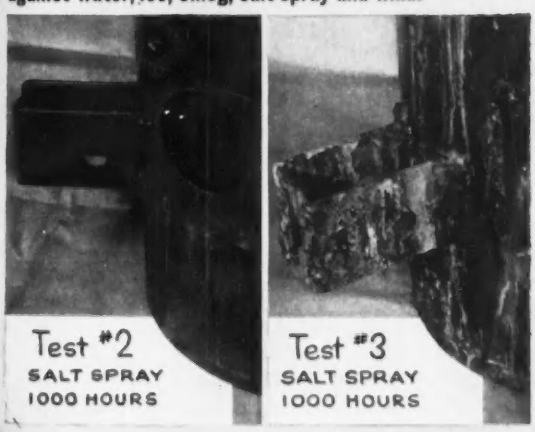
The new V.I.P. Finish for Pole Star Distribution Transformers and Regulators is *more* than a paint. Basically a *vinyl* finish with an *inner phosphate* coating, V.I.P. Finish gains its outstanding characteristics from careful preparation and pretreatment of the metal, followed by meticulously controlled application of the various coats.

A principal reason for the amazing weatherability of V.I.P. Finish is that it provides not only extra-high *primary* resistance to moisture, alkali and acids . . . but also sets up a secondary or insurance barrier that prevents the spread of corrosion if any bare metal becomes exposed, as in the case of accidental scratching. Such spots can be touched up with complete assurance that no underfilm corrosion will occur.

V.I.P. Finish is designed to save maintenance costs, even when transformers and regulators are exposed to the most highly corrosive atmospheres. Tests prove this. To take advantage of new V.I.P. Finish on your next distribution transformers or regulators, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW EDISON

Here is just one of the dozens of tests that prove outstanding superiority of V.I.P. finish . . . culmination of 15 years of research on protection of transformer tanks against water, ice, smog, salt spray and wind.



Salt Spray Tests

Temperature of cabinet: 95 F ±5 F. Salt solution: 20% (specific gravity of 1.126-1.158). Minimum duration of tests: 1000 hours. Ratings, as shown in the following table, were on the basis of "10" for perfect and "0" for complete failure.

RATINGS

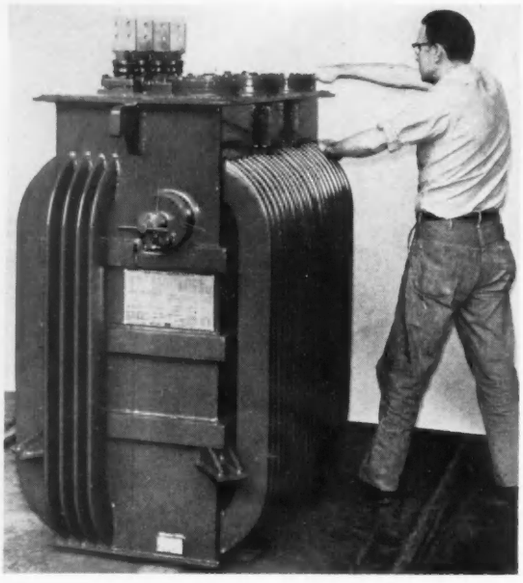
System	Thickness (Mils)	Blistering	Underfilm Corrosion	Loss of Adhesion	Average
V.I.P. Finish	3-4	9.0	9.5	10.0	9.8
Ordinary Finish	2-3	0.0	4.0	5.0	3.0

In this most rigorous of all tests, V.I.P. Finish (lefthand photograph) rated excellent on all counts. Note the amazing degree of effectiveness around lift lug and mounting bracket.

Ordinary transformer paint system (righthand photograph) scored *less than half* as well as V.I.P. Finish on all counts. Extreme corrosion was evident in some spots.

Transformers and Regulators

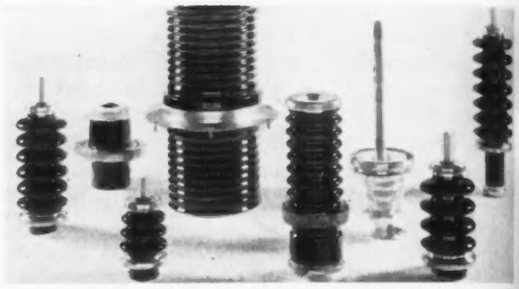
(For further information refer to Readers Service on page 130)



Substation Transformers . . .

. . . in 15-kv class have 95-BIL instead of 110-BIL insulation on high voltage side. These three-phase units are available in ratings of 750, 1,000, and 1,500 Kva. Most accessories have been removed, resulting in a reduced size and weight, and lower initial cost. The same design is used for units with high voltage potheads or bushings.

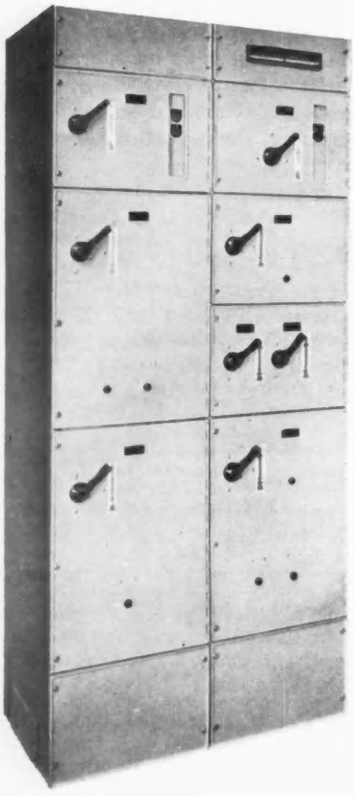
Moloney Electric Co, St. Louis 20, Mo.



Solder-Seal Bushing . . .

. . . for low-voltage applications on hermetic capacitors, test transformers and similar equipment is leak-proof. It has high mechanical and dielectric strength and can be designed in a variety of shapes, sizes, and ratings. Metal caps, flanges, and rings are soft-soldered to "fired-on" metal coating on the porcelain.

Lapp Insulator Co, Inc, Le Roy, N. Y.



Motor Control Center . . .

. . . for central stations provides group central control of motors through 200 hp. Modular units, available in heights of 14, 28, 42, 56, and 70 in., are used in standardized 90-in. enclosures. Compartments are isolated by individually interlocked doors. All units are accessible from the front. Full-length rear doors provide access to wiring.

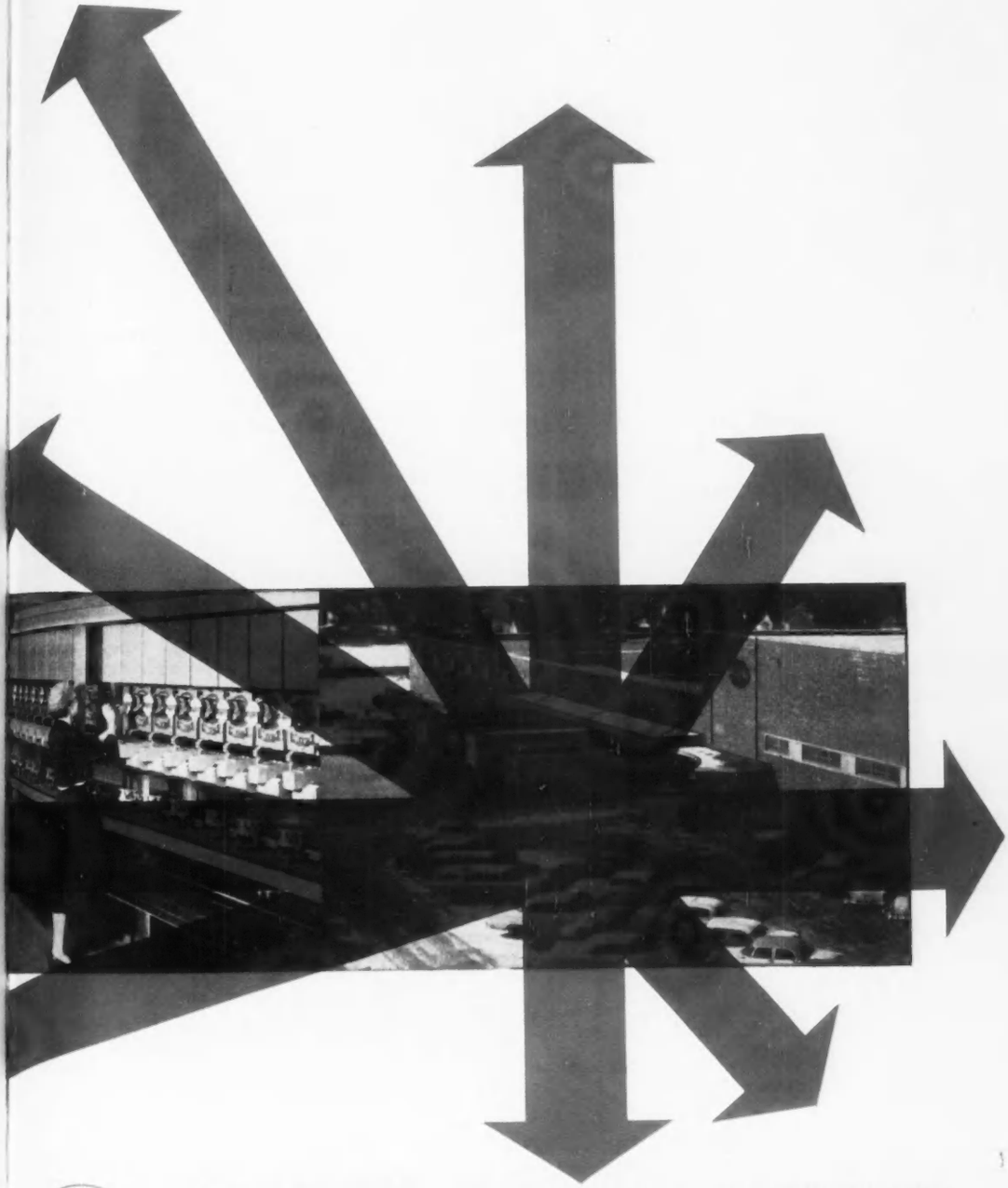
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

(More New Equipment on page 126)

tric V-60's your best meter buy.
There's a G-E V-60 meter to handle every Class 10, 100 or 200 two-stator polyphase application. Depending upon your needs, specify the V-62 (network and 3-wire, 3-phase),

FOR COMPLETE INFORMATION on G-E's new V-60 polyphase meter line, contact your nearest G-E apparatus sales representative or write General Electric Company, Section 628-28, Schenectady 5, N. Y.

DELIVERY ON POLYPHASE METERS



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM60-8

Progress Is Our Most Important Product

GENERAL ELECTRIC

NOW... Pennsylvania doubles the tank protection of Pole Star transformers and regulators with new V.I.P.

V.I.P. *pretreats tank surfaces to resist corrosion*

V.I.P. *prevents spread of rust if scratches occur in handling*

V.I.P. *provides extra-high resistance to moisture, alkali, acids*

V.I.P. *protects against incipient corrosion at edges, corners*

V.I.P. *produces high-gloss finish that long retains its luster*

This is the 5-Step V.I.P. process that provides all-weather, all-climate protection for Pole Star distribution transformers and regulators

The sketch at left illustrates the five-step V.I.P. Finish (vinyl with inner phosphate). Note that it is not just a new paint, but a complete metal-finishing process that assures all-climate, all-weather protection.

1. Shot-blasting with steel grit removes all scale, grease and dirt, and provides "toothage" for adhesion of the first coat to the steel surface.

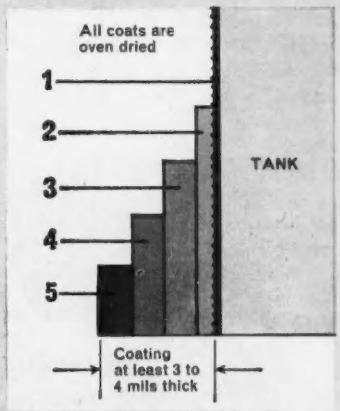
2. A combination chemical pretreatment and primer applied by the flow method simultaneously form a phosphate coat and thin organic film on the clean metal. This is the step that gives V.I.P. its ability to prevent the spread of corrosion, even if the metal is scraped bare in spots.

3. A tough vinyl combined with non-leafing aluminum form an almost impenetrable surface against moisture or moisture vapor. This coat is flowed on.

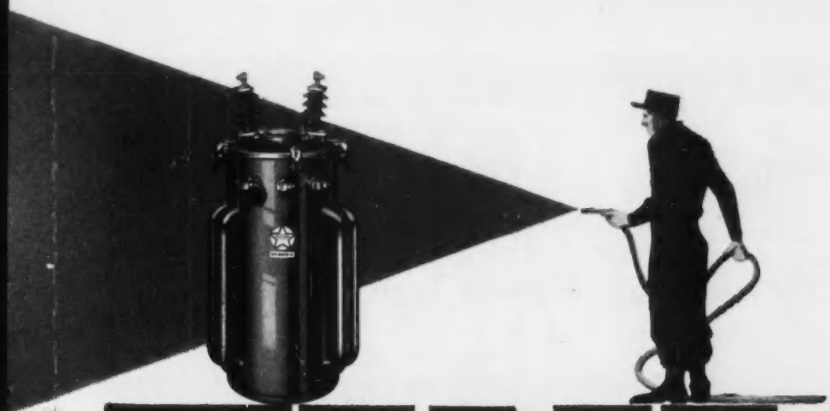
4. An alkyd-titanium paint (used successfully on Pole Star Transformers for many years) is flowed on to provide a heavy, uniform coverage.

5. A final coat of blue-gray alkyd-titanium paint is sprayed on to assure a smooth finish with a maximum gloss. This, together with the preceding coat, forms a hard, elastic finish that resists weathering and does not fade or chalk too quickly.

Total thickness is three to four mils. All coats are oven dried at controlled temperatures.



Pennsylvania POLE STAR Distribution



FINISH*

*Vinyl with Inner Phosphate

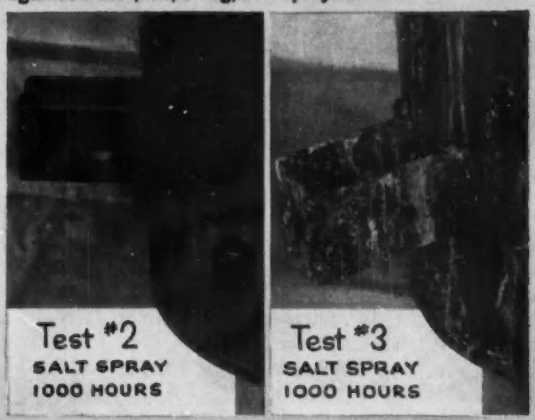
The new V.I.P. Finish for Pole Star Distribution Transformers and Regulators is *more* than a paint. Basically a *vinyl* finish with an *inner phosphate* coating, V.I.P. Finish gains its outstanding characteristics from careful preparation and pretreatment of the metal, followed by meticulously controlled application of the various coats.

A principal reason for the amazing weatherability of V.I.P. Finish is that it provides not only extra-high *primary* resistance to moisture, alkali and acids . . . but also sets up a secondary or insurance barrier that prevents the spread of corrosion if any bare metal becomes exposed, as in the case of accidental scratching. Such spots can be touched up with complete assurance that no underfilm corrosion will occur.

V.I.P. Finish is designed to save maintenance costs, even when transformers and regulators are exposed to the most highly corrosive atmospheres. Tests prove this. To take advantage of new V.I.P. Finish on your next distribution transformers or regulators, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW EDISON

Here is just one of the dozens of tests that prove outstanding superiority of V.I.P. finish... culmination of 15 years of research on protection of transformer tanks against water, ice, smog, salt spray and wind.



Salt Spray Tests

Temperature of cabinet: 95 F. ±5 F. Salt solution: 20% (specific gravity of 1.126-1.158). Minimum duration of tests: 1000 hours. Ratings, as shown in the following table, were on the basis of "10" for perfect and "0" for complete failure.

RATINGS

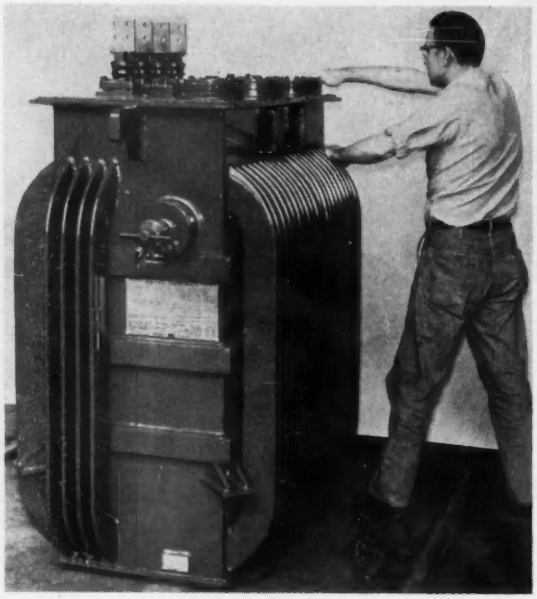
System	Thickness (Mils)	Blistering	Underfilm Corrosion	Loss of Adhesion	Average
V.I.P. Finish	3-4	9.0	9.5	10.0	9.8
Ordinary Finish	2-3	0.0	4.0	5.0	3.0

In this most rigorous of all tests, V.I.P. Finish (lefthand photograph) rated excellent on all counts. Note the amazing degree of effectiveness around lift lug and mounting bracket.

Ordinary transformer paint system (righthand photograph) scored *less than half* as well as V.I.P. Finish on all counts. Extreme corrosion was evident in some spots.

Transformers and Regulators

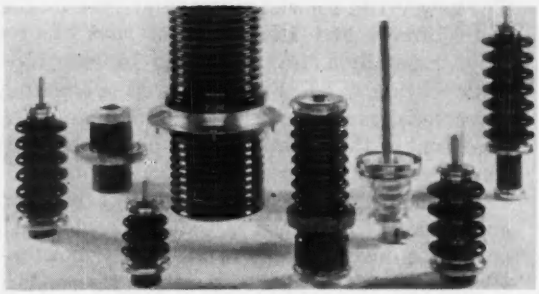
(For further information refer to Readers Service on page 130)



Substation Transformers . . .

. . . in 15-kv class have 95-BIL instead of 110-BIL insulation on high voltage side. These three-phase units are available in ratings of 750, 1,000, and 1,500 Kva. Most accessories have been removed, resulting in a reduced size and weight, and lower initial cost. The same design is used for units with high voltage potheads or bushings.

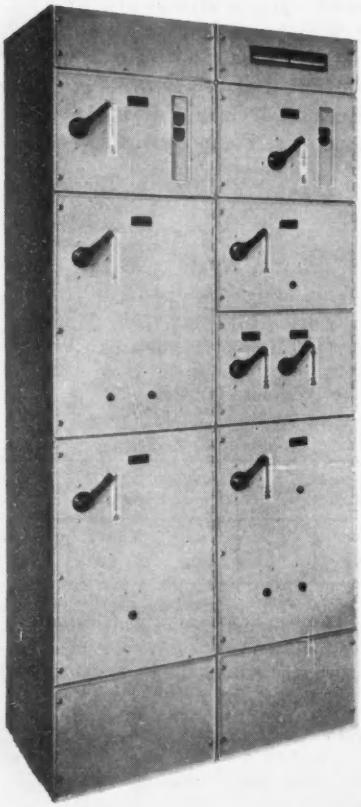
Moloney Electric Co, St. Louis 20, Mo.



Solder-Seal Bushing . . .

. . . for low-voltage applications on hermetic capacitors, test transformers and similar equipment is leak-proof. It has high mechanical and dielectric strength and can be designed in a variety of shapes, sizes, and ratings. Metal caps, flanges, and rings are soft-soldered to "fired-on" metal coating on the porcelain.

Lapp Insulator Co, Inc, Le Roy, N. Y.



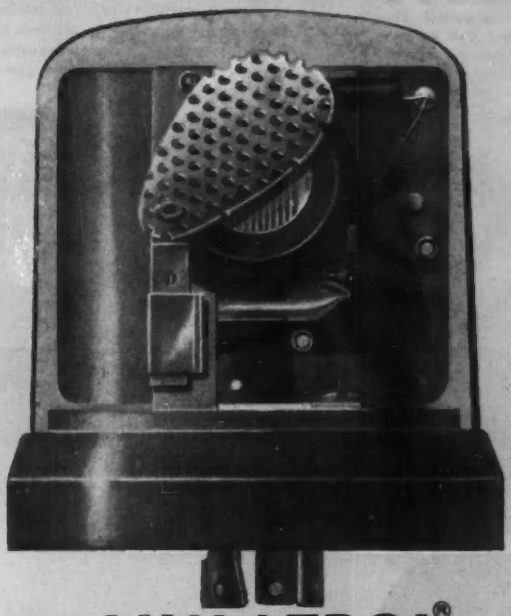
Motor Control Center . . .

. . . for central stations provides group central control of motors through 200 hp. Modular units, available in heights of 14, 28, 42, 56, and 70 in., are used in standardized 90-in. enclosures. Compartments are isolated by individually interlocked doors. All units are accessible from the front. Full-length rear doors provide access to wiring.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

(*More New Equipment on page* 126)

FROM EVERY POINT OF VIEW



MARK I LUMATROL, Tubeless
(Actual Size)
NEMA MOUNTING

THE NEW MARK I **LUMATROL**® GUARANTEES HIGHEST RELIABILITY AT LOWEST COST IN AUTOMATIC STREET LIGHT CONTROL

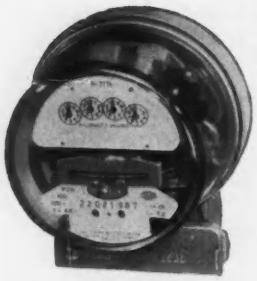
Write for complete specifications

MICRO BALANCING, INC., HERRICKS ROAD, GARDEN CITY PARK, L.I., NEW YORK

In Canada: J. R. Kearney Corp., Box 270, Guelph, Ontario

DEVELOPED TO MEET YOUR NEEDS...

ACCELERATED



SANGAMO P2 (two element) Meters accurately measure loads from 18 to 96,000 watts. They give sustained accuracy because of Sangamo's precise factory calibration... skillful design... careful selection of materials... rigid manufacturing control. Slow disk speed, reduced current and potential damping provide greater inherent accuracy in P2 meters.

Now, through new techniques, Sangamo polyphase meters are shipped only five days after your order is received at our Springfield plant. This fast, pacesetter service is made possible through a new order entry system, a new manufacturing scheduling system—using our IBM computer—and new shipping techniques and facilities.

Meters flow from assembly and test lines *to you* without delay. The new million dollar factory warehousing-shipping operation backs up local meter stocks.

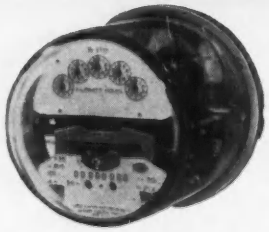
Consider this: Five day service on P2 and P3 meters (with demand registers too!) means that you can reduce inventories, and still have the meters *when you need them.* It means you can utilize your crews more effectively, reduce handling, and save storage space. In short, you can cut costs all along the line.

Want to be convinced that our delivery is really fast? Just keep tabs on your next order of Sangamo polyphase meters—the quick delivery time is your proof.

Want to be convinced of the excellence of P2 and P3 meters? Order some and test them. We are sure you will be pleased.

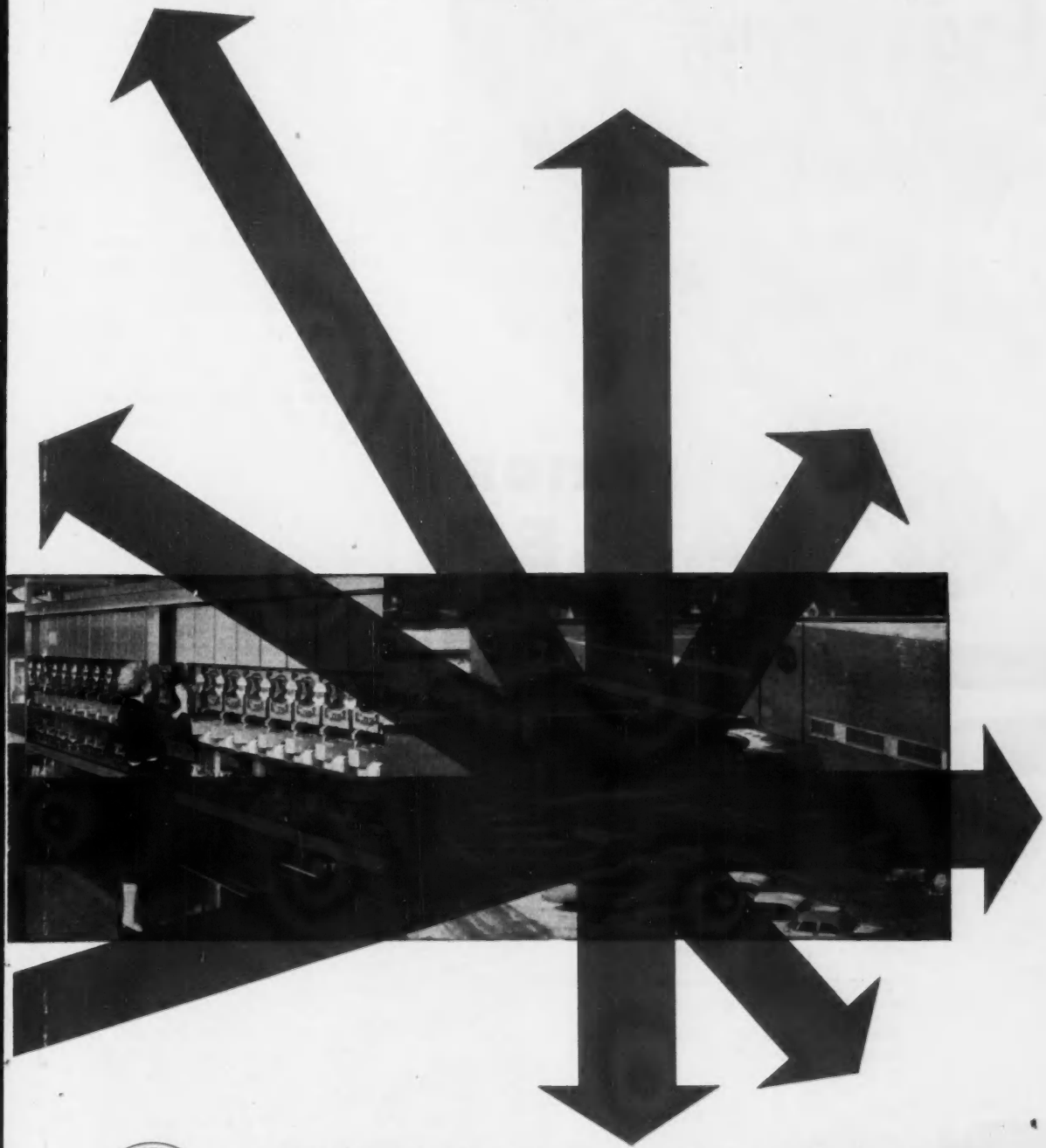
RAPID DELIVERYMAN... SANGAMO STYLE

A computer in the role of deliveryman? Sure... for at Sangamo, our IBM computer plays a key role in getting P2 and P3 meters to you faster. We use it to process orders, to program production, and to determine the number of components necessary to produce the meters you need when you want them. It performs these duties in minutes, not days... lets us telescope the time it takes to process your order, assemble, and ship your meters.



SANGAMO P3 (three element) Meters give you full revenue from large loads. Full 200 ampere capacity. Modern, small size, single disk round design cuts weight by 50%—volume by 50%—over that of bathtub-type three-stator meters. Replacement covers for P3 meters save you money, too.

DELIVERY ON POLYPHASE METERS



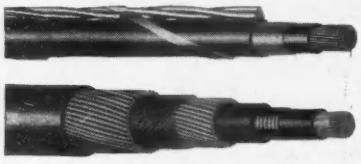
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM60-1

Custom-Engineered

SUPERIOR CABLES



developed for you by communication specialists

The way to make sure the cable you buy is the cable you need is to bring your problem to SUPERIOR!

From your specifications, SUPERIOR communication specialists will originate the design and construct the cable to meet your requirements.

Plastic insulated and jacketed SUPERIOR CABLES are packed full of performance.

When you have any cable problem . . . tell it to SUPERIOR!

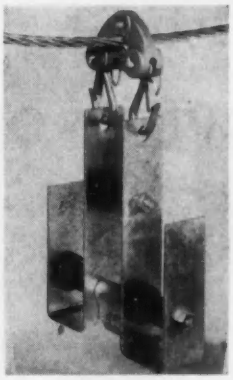
For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

4279



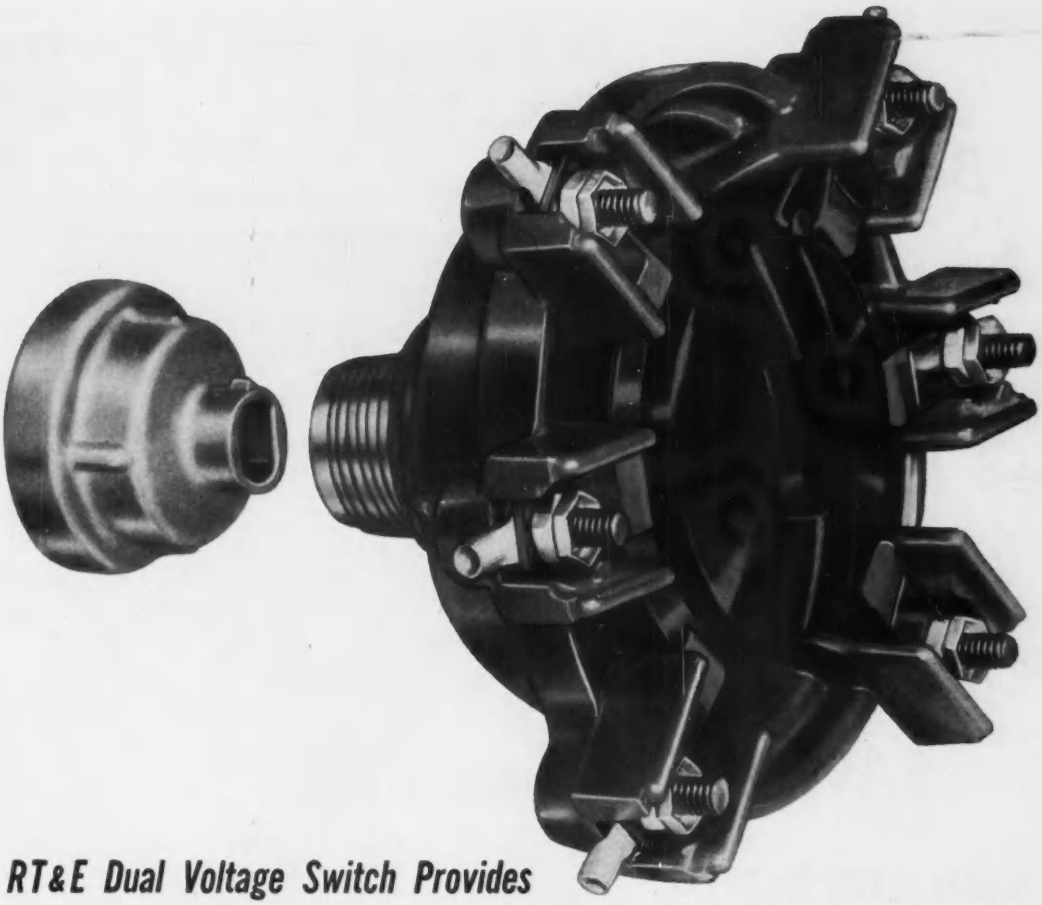
Stringing Block . . .

. . . has delta configuration of non-metallic spools mounted on bearings. The No. MST-3 gives proper position and near conductor spacing on 9 and 15-kv systems. A cast aluminum clevis over messenger is secured with safety snap hooks.
Distribution and High-Line Specialties Co, 2100 Del Norte, St. Louis 17, Mo.

Meter Tester . . .

. . . for portable standard watthour meters provides speed, ease of operation and high accuracy. Accurate tests may be conducted on 24 current ranges and on five potential ranges while using for comparison only one single-range reference instrument or, if desired, a matched set of three. Current ranges are from 0.25 to 100 amp, and potential ranges are 120, 208, 240, 277 and 480 v. Up to 15 rotating standards may be loaded and tested at one time.
Knopp, Inc, 1307 66th St, Oakland 8, Calif.

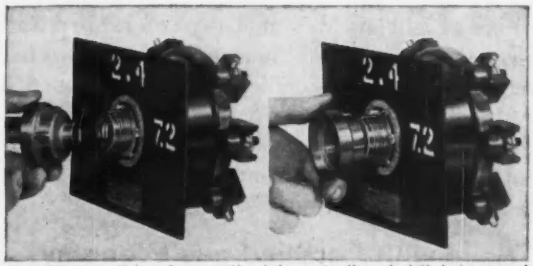
(*More New Equipment, p* 132)



New RT&E Dual Voltage Switch Provides

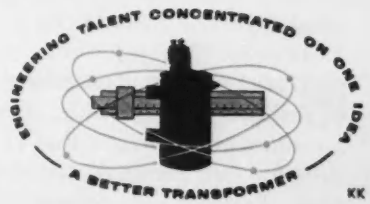
FOOLPROOF OPERATION

You cannot operate this improved RT&E dual voltage switch incorrectly. It can be moved only with the keyed handle provided, and the switch must be correctly positioned before the handle can be removed. This successor to the industry's first externally-operated dual voltage switch demonstrates further proof of RT&E's four years of dual voltage experience. Improvements include a new body of shatterproof polyester glass, dimensionally, chemically, and thermally stable, and new spring-loaded contacts that assure constant positive contact pressure. In addition, this single switch handles both even and odd multiple voltages. Plan to uprate your system now, with RT&E dual voltage equipment — transformers with more built-in experience.



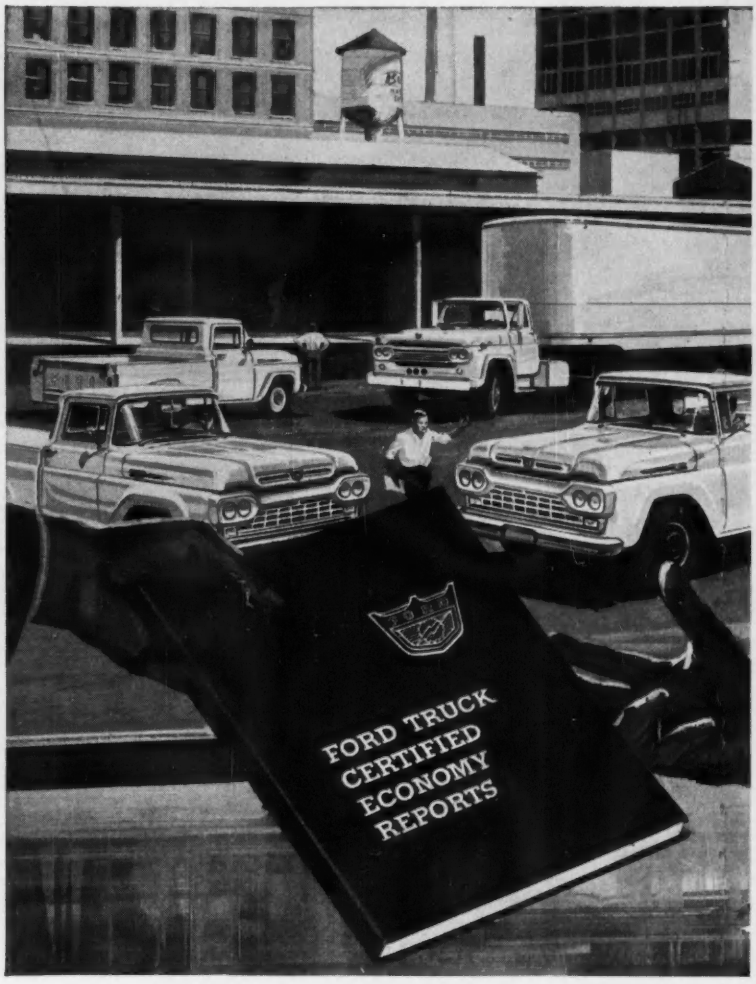
SAFE! Unique keying action between handle and slotted ring around shaft assures positive positioning before handle can be removed.

RT&E CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON



KK

Before you buy a truck, be sure you see this book! It tells what FORD TRUCK SAVINGS can mean to you.



$26 to $246 lower priced...25% better

Wouldn't it be great if you could fully test a truck before you bought it? Compare its gas mileage with other makes . . . determine how well it will hold up . . . how reliable it will be on the job?

Well, these tests have already been made for you by independent research engineers. The certified results of these tests are now available in the "Certified Economy Reports" book at your local Ford Dealership. These test results, together with a comparison of the manufacturers' suggested list prices of the five leading makes, represent the greatest assurance you can have that Ford Trucks give the most for your transportation dollar. These are the types of savings you can expect with a '60 Ford.

Save with Certified lowest prices*!

Ford's Light and Medium Duty Trucks are priced lower than comparable models of the four other leading makes. For example, you can save from $33 to $181 on the list price of a standard ½-ton pickup. The savings on a ¾-ton pickup run from $32 to $185 and the initial price advantage on a Ford 1½-ton stake model ranges from $26 to $246.

Save with Certified gas economy!

Ford ½-ton pickups beat all competition in Economy Showdown, U.S.A.! Ford's standard 6-cylinder engine delivered more miles per gallon in every test—low and high speed highway driving, simu-

gas mileage...doubled tire life!

lated city traffic and door-to-door delivery. The average figure for all the tests conducted by independent research experts shows a Ford advantage of 25.2% more miles per gallon.

Save with Certified tire life!

Ford's true truck front suspension saves on tire wear. Independent experts checked tire wear of the 1960 Fords with competitive makes using a soft-type suspension and found that the front tires on a Ford lasted twice as long. Your Ford Dealer has all the test results in his "Certified Economy Reports" book. Go in and check the record.

**Based on latest available manufacturers' suggested retail prices, including Federal excise tax, excluding dealer preparation and conditioning and destination charges*

FORD TRUCKS COST LESS

...LESS TO BUY...LESS TO RUN...BUILT TO LAST LONGER, TOO!

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Moloney.....Sub Transformer ☐
Lapp Insulator.Solder-Seal Bushing ☐
Westinghouse.....Control Center ☐
Dist & High-Line...Stringing Block ☐
Knopp.....Meter Tester ☐
Kuhlman .....Bushing ☐
Line Materials....Power Pedestals ☐
Standard Tsf.....Transformer ☐
Joslyn .....Luminaires ☐
Erlen.....Chemical Control ☐

OTHER

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Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* **Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.**

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TITLE_____
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ADDRESS_____
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FOR:
Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

FEBRUARY 29, 1960

HOW DO REPUTATIONS GROW?

THE REAL REASONS BEHIND THE FAST-GROWING RESPECT FOR PRECISION TRANSFORMERS

FEATURE ARTICLES HELP!

BUT... THE *TRANSFORMER* IS MOST IMPORTANT!

THESE ARE THE GUTS... OF THE PRECISION TRANSFORMER

SPECIAL CORES: Specially designed wound cores, manufactured from highest quality, non-aging cold rolled silicon steel. Processed to obtain the best possible characteristics for top performance and most output per pound.

RIGID CORE CLAMPING: The cores are individually clamped and braced throughout. Complete assembly positively located. Noises are suppressed... permanent alignment maintained regardless of shipping shocks.

SPECIAL COIL DESIGN: Coils are wound with large number of cooling ducts. Transformers are designed for low winding temperature gradient permitting large overload capacity. Temperature variations are minimized—there are no hot spots.

LOW IMPEDANCE: This feature means, (1) better regulation... (2) overloads with minimum revenue loss... (3) elimination of low voltage complaints.

BUSHINGS LOCKED WITH TANK: Bushings don't turn with the bolt when installing transformer. Wet process porcelain means high dielectric and mechanical strength.

EASY IDENTIFICATION: The TAP CHANGER is marked on base and on tap changer indicator for positive identification. It is designed to be easily accessible... quick snap action.

NO CONNECTION ERRORS: Low voltage leads are permanently identified to prevent improper reconnections in the field.

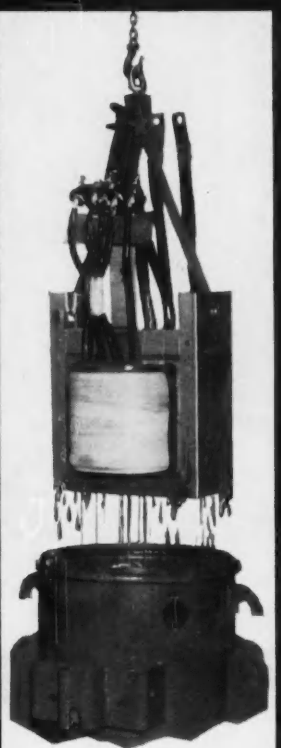
SEEPAGE PROTECTION: All tank seams are automatically welded and pressure tested to assure against seepage.

LEAK PROOF SEAL: Designed with simple, single bolt cover fastening which provides uniform pressure on gasket. Spring action of cover insures leak proof seal.

DURABLE GASKETS: The gasket is made of an oil and askarel resistant material (1) to insure long life... (2) to maintain elasticity through wide range of temperature and pressure changes.

MAINTENANCE CUT: A chromate primer is used. Also two coats of enamel are applied—each separately baked and tested to meet the most rigid specifications.

TESTING FOR DEPENDABILITY: Production line impulse assures uniform High Quality. All NEMA and EEI standards and tests are complied with in full.

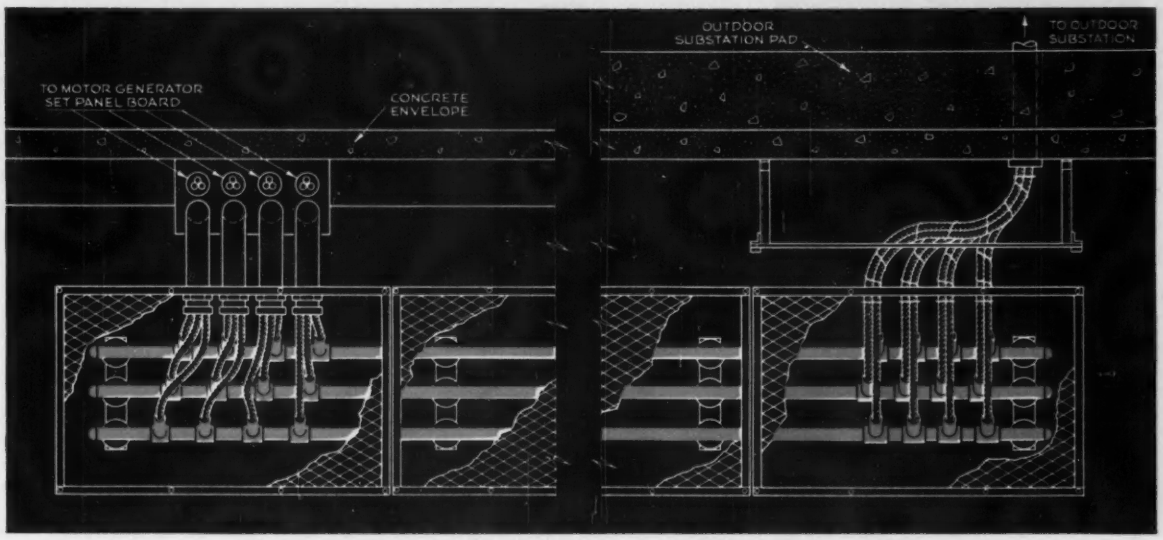


A Typical, modern design PTC Transformer

PRECISION TRANSFORMER Corp. stands behind all its transformers with the industry's ONLY 5-YEAR Unconditional GUARANTEE.

PTC
TRANSFORMERS
QUIET • EFFICIENT
DEPENDABLE

PRECISION TRANSFORMER CORP.
2216 West Lake Street • Chicago 12, Illinois
Representatives in all principal cities



Side elevation of secondary bus system, using round tubular copper bus conductors, 2½" S.P.S., in unused plant tunnel. The run is approximately 275 feet long.

Round copper tube bus carries more amperes per pound of copper—cuts installation costs

When a large eastern electrolytic refinery recently shifted to purchased electric power, it capitalized on the electrical and mechanical advantages of round tubular copper bus conductors to effect some economies.

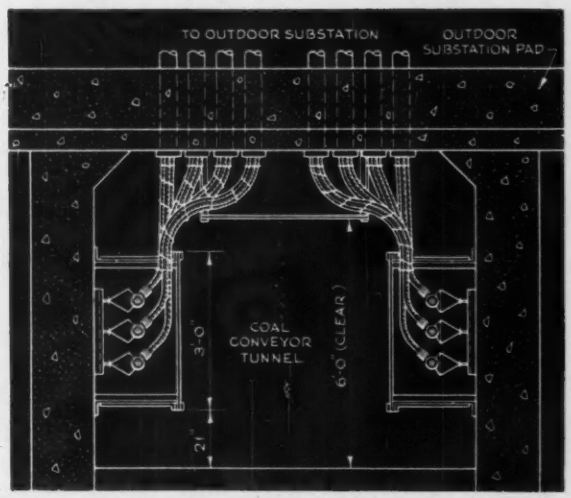
Directly below the 10,000 kv-a outdoor substation was an unused coal conveyor tunnel that ran some 275 feet back to the former powerhouse. In this, the secondary bus system using 2.3-kv high-conductivity bus tube, 2½" S.P.S., was installed as shown in the drawings.

These round conductors, having an extremely low skin-effect ratio (1.01) can carry well over 300 amperes per pound of copper—compared with less than 275 amperes per pound for rectangular bus of the same cross-sectional area.

In addition to this material saving, round conductors in standard pipe sizes made possible installation savings through the use of stock-size supports, connectors, and other hardware.

Substantial savings are often possible through the use of a tubular bus with a low wall-thickness-to-diameter ratio. More complete information on tubular conductors is available in the Sixth Edition of The American Brass Company's Publication C-25. This 62-page booklet has a wealth of general information on the properties of copper conductors—plus convenient data for the most commonly used sizes of all types of rigid bus conductors.

TECHNICAL SERVICES. Anaconda specialists are available to help you in the solution of technical problems involving the use of Anaconda Bus Conductors. For such service, or for a copy of Publication C-25, see your nearby Anaconda representative. Or write: The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass, Ltd., New Toronto, Ontario.



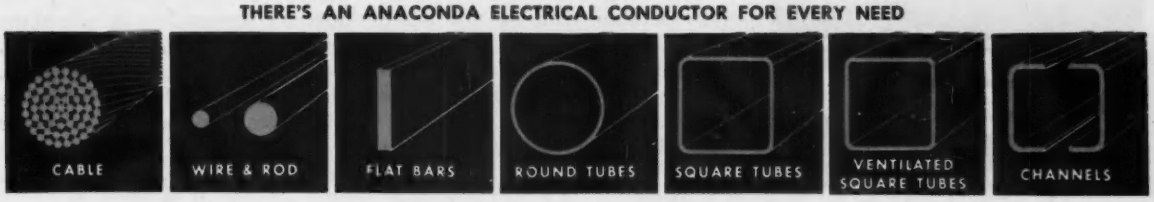
End elevation of tunnel showing how bus conductors are mounted on either wall, covered by a simple expanded metal enclosure.

ANACONDA®

COPPER CONDUCTORS

Made by The American Brass Company

THERE'S AN ANACONDA ELECTRICAL CONDUCTOR FOR EVERY NEED

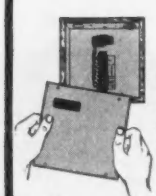


GTC

UNITIZED
COMMUNICATION EQUIPMENT for POWER and INDUSTRY

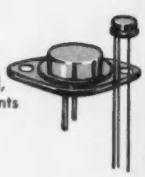
Effective! Reliable! Economical!

1 Highly effective in extremes of ambient noise and temperature.



2 Plug-in units provide ease of installation, expansion and maintenance.

3 Transistors and rugged, industrial type components used throughout.



4 Central control cabinet, costly engineering and fabrication eliminated.

Wherever a highly dependable, voice communication system for use in high noise level areas is needed—you'll find GAI-TRONICS specified by name.

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

GAI-TRONICS
CORPORATION
Dept. A
READING, PENNA.

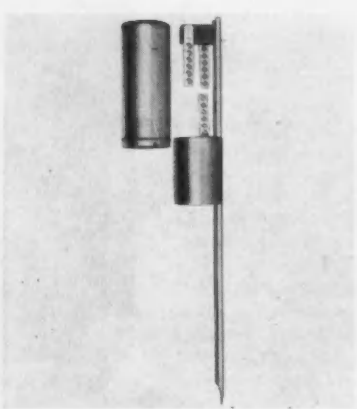
GAI FOUNDED 1946

A SUBSIDIARY OF GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

Bushing . . .

. . . **reduces radio noise** and interference by use of a stress relieving ground sleeve encasing the bushing shank. Other features are a full-protection hand-grip; porcelain construction with heavy, strong skirts; spring-loaded terminal accommodating a wider range of aluminum and copper conductors; and, internal clamping.

Kuhlman Electric Co, Birmingham, Mich.



Power Pedestals . . .

. . . **have eyebolt terminal strips.** Designed primarily for use with Transclosures and pad-mounted transformers, the pedestals facilitate above-ground connections of underground services to secondary mains. They accommodate six 4/0 mains and 12 2/0 services, have large, removable domes, simplifying maintenance and projecting above ground.

Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Current Transformer . . .

. . . **has ratings from 1,200 through 5,000 amp** with 5 amp secondary and is for use on circuits through 15,000 v. The outdoor or indoor unit (Type OTR), a window type, meets ASA and NEMA requirements for high-accuracy metering applications.

Standard Transformer Co, Warren, Ohio.

Luminaires . . .

. . . **are now offered** as automatic street lighting switches for all types of light distribution and for either incandescent or mercury lamps.

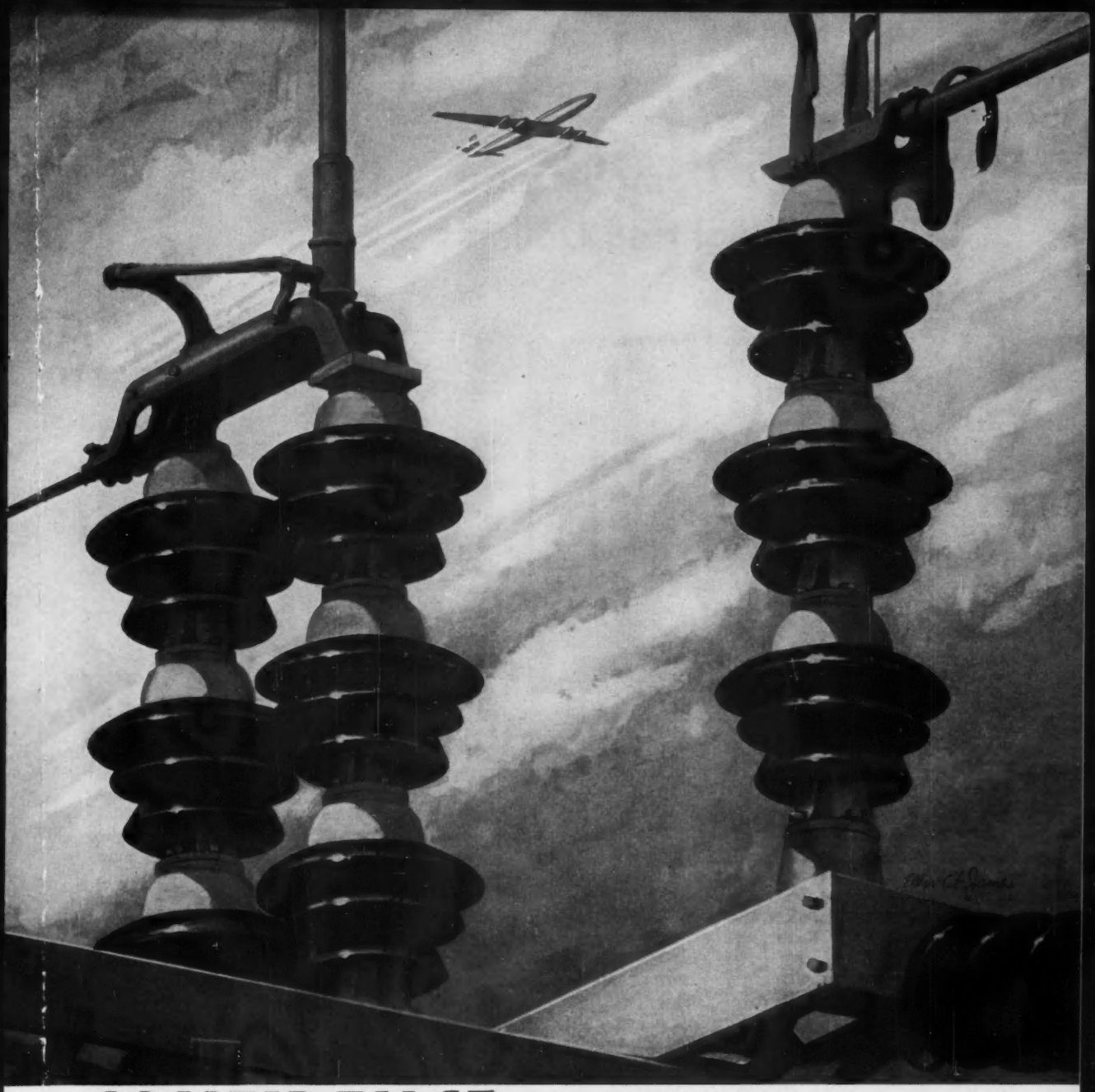
Photo-electric relays of either the plug-in or twist-lock type attach directly to luminaire heads and are fully wired for automatic operation.

Joslyn Mfg & Supply Co, 155 N Wacker Dr, Chicago 6, Ill.

Chemical Control . . .

. . . **provides economy** of power, water, chemical consumption, and labor in feeding balanced chemical treatment into circulating water systems. The unit, called the Chemicator, is a small, lightweight, closed reservoir, mounted on the side of the equipment, through which a portion of the recirculating water flows. Chemicals are fed at a pre-determined rate only when needed in the operation.

Erlen Products Co, Burbank, Calif.



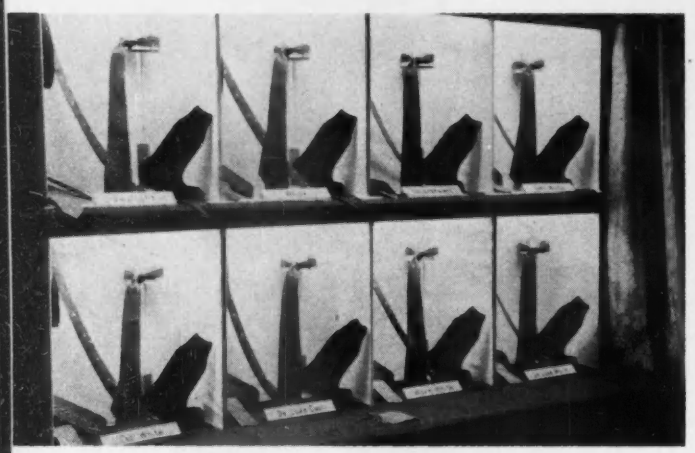
CONFIDENCE

Victor No. 729 Apparatus Insulators stand like sentinels atop this sub-station, guarding high voltage conductors and costly switching equipment.

It's your responsibility to supply power to all sorts of customers ranging from small householders to big industrials. Nothing puts the response into responsibility like insulators that won't let you down, assuring continuity of service. Power men who take their responsibility seriously depend on VICTOR Apparatus Insulators—the only insulators in the world made of **Purified Porcelain,** finest porcelain ever developed. To retain your continued confidence, we make insulators that won't cross you up—or us, either. Victor quality is not just skin-deep—it goes all the way through the complete assembled apparatus insulator. For catalog, specifications and prices contact your nearby VICTOR Sales Office. Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E CIRCUIT BREAKER COMPANY

Road Show Demonstrates Profit in Lighting Dollars



LIGHTING DEMONSTRATIONS featured different types of store lighting, left, and Etzon, a flexible fluorescent lighting product employing a small high frequency generator, above

R. L. SAWYIER, JR., Chief Illuminating Engineer, Pacific Gas & Electric Co, San Francisco, Calif.

Last year marked one of the most significant milestones on the road to lighting achievement. Most of it is attributable to the new foot-candle standards established by the Blackwell Report and the Illuminating Engineering Society.

In the utility business alone, the potential from these new standards represents nearly $2 billion a year nationally in additional revenue.

The figure these new levels could mean to lighting fixture manufacturers is almost astronomical.

With such a revolutionary fact to consider in formulating a commercial lighting promotion, Pacific Gas & Electric decided that a short-term specialty program to bring this new lighting concept to customers would pay off in long-term results.

Most of the major firms connected with lighting in Northern California were tied into this promotional effort either directly or indirectly through their support as members of the Northern California Electrical Bureau. The Bureau, together with PG&E, embarked on a plan called The Travelling Lighting Road Show and Store Lighting Clinic.

It had two primary objectives:

1. To reach personally as many commercial customers on our system as possible, so that the benefits of better lighting could not only be told to them, but shown as well.

2. To indoctrinate the architects, engineers, and electrical contractors through mass education in the techniques of lighting design and calculation, and inform them of the latest innovations in equipment and sources.

Basically, this travelling show consisted of 20 three-day stands in various strategically located cities in Northern California. The first day of each exhibit was devoted to an 8-hr session on lighting fundamentals, light sources, light control, lighting design, and how to sell the benefits of good lighting—and was open to architects, engineers, and electrical contractors. A charge of $5.00 was made to defray dinner expenses.

The second and third days featured a lighting demonstration open house, directed primarily at store owners. However, the demonstrations were versatile enough to suit the needs of office managers, and most other commercial applications of light.

Vivid demonstrations of how to overcome reflections in show windows were one of the more dramatic parts of the lighting clinic. Using the new technique of using luminous backgrounds to overcome the 8% reflections characteristic of plate glass, and thereby making the window glass again completely transparent, the reflections were literally dialed out of the window in front of the merchants' eyes.

Another exhibit featured three full-sized display windows with revolving stages to create three changes of merchandise on each stage. With this, the store owner could compare the same merchandise under three different color temperatures, and determine for himself the advantages of deluxe fluorescent vs standard fluorescent vs incandescent.

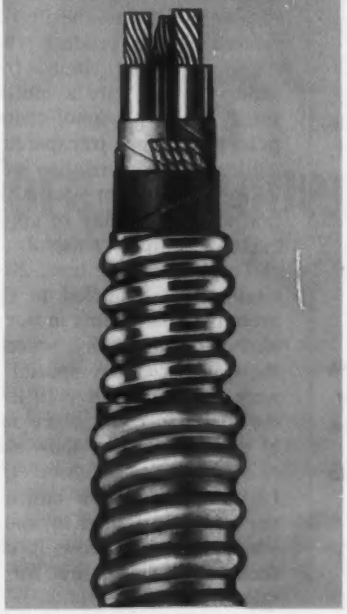
A full-sized cutaway section of a room was used to illustrate some 25 different applications of lighting fixtures to obtain the "3 A's of Store Lighting" — attraction, appraisal,

(*Continued on p.* 136)

C-L-X INTEGRATED CABLE SYSTEM

Requires no separate Duct or Conduit in any environment

Unusual pliability of C-L-X Sheathed Cables is shown here as the cable is being installed.



The revolutionary C-L-X Continuous, Corrugated, Lightweight, metallic sheath, that Simplex introduced to this country two years ago, is now available in *Aluminum*, *Copper* or *Bronze* as well as the enormously successful *Steel*.

Simplex C-L-X pliable cable systems provide unexcelled ease of installation and mechanical protection.

The *corrugated* metal sheath combines pliability for ease of installation with very great strength and seals the cable against penetration by oil, chemicals and moisture.

Depending on the environmental conditions of the installation, these power, control and communication cable systems can be furnished with or without plastic jacketing.

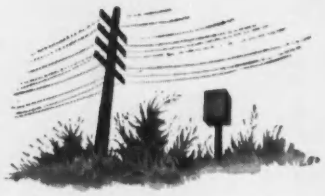
Light, and pliable, C-L-X cables are easily installed, and require no special reels.

Now, with corrugated *Aluminum*, *Copper* or *Bronze* sheathed C-L-X cable systems, the low resistance of these metals permits designs where the sheath may be used as a neutral or ground. These metals also permit the use of single as well as multiconductor cable assemblies in a-c power systems.

For complete details on C-L-X sheathed cables, contact your Simplex Engineer, or write direct.

Simplex
WIRE & CABLE COMPANY
79 Sidney Street, Cambridge, Massachusetts

Whatever your brush problem



Line?

Roadside?

Right-of-way?

WEEDONE can solve it!

With the right background—Chemical control of weeds and brush has developed along established lines of procedures and practices. Amchem initially pioneered the major advances in the field, has originated many of today's accepted procedures and products for efficient, economical weed and brush control. Your problems are in *experienced* hands when you hand them to Amchem!

With the right approach—Amchem's corps of weed and brush specialists are basically application specialists. Combining comprehensive theoretical and practical experience they are able to offer all industry a realistic approach to *any* weed or brush problem. These specialists have developed a variety of efficient weed and brush eradication programs over thousands of miles of line, roadside and right-of-way areas once choked and inoperable due to infestation.

With the right product—Amchem's tremendously diversified product line is your assurance that the right weed and brush killer is available and will be utilized for your specific problem. Weedone Brush Killers, for example, have been used in the field for years and proven eminently successful in eliminating weeds and brush wherever they are a problem. Why not bring your problems to Amchem?

Amchem and Weedone are registered trademarks of Amchem Products, Inc.

AMCHEM PRODUCTS, INC.
AMBLER, PA.

Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

AMCHEM

WEEDONE

BRUSH KILLERS

another chemical development of
Amchem Products, Inc.
(Formerly American Chemical Paint Co.)
St. Joseph, Mo. • AMBLER, PA. • Niles, Calif.

Lighting Road Show

(*Continued from page* 134)

and atmosphere. Such unique units as Kliegl wall washers, pinhole spots, snorkel lights, valances, coves, and many others proved to the customer what proper equipment could do to make his store more individual, attractive, and increase suggestive selling and impulse buying.

A complete portable luminous ceiling was also displayed, showing the simplicity of ceiling construction and demonstrating eight different methods of diffusion and louvering. Twenty linear feet of "Black Boxes" proved the magic of light. These were called the Science of Seeing displays, and office managers could see first hand how, with more light, you can see faster, and get more work done per hour; how room dimensions and wall colors drastically affect the lighting efficiencies in a building; and many other interesting and useful facts about light which would mean money in the pockets of the customers.

A complete relay-controlled showcase, wallcase and shadow box combination illustrated the methods of lighting various items by backlighting, toplighting, bottomlighting, and the use of color on backgrounds to enhance the appearance of the merchandise.

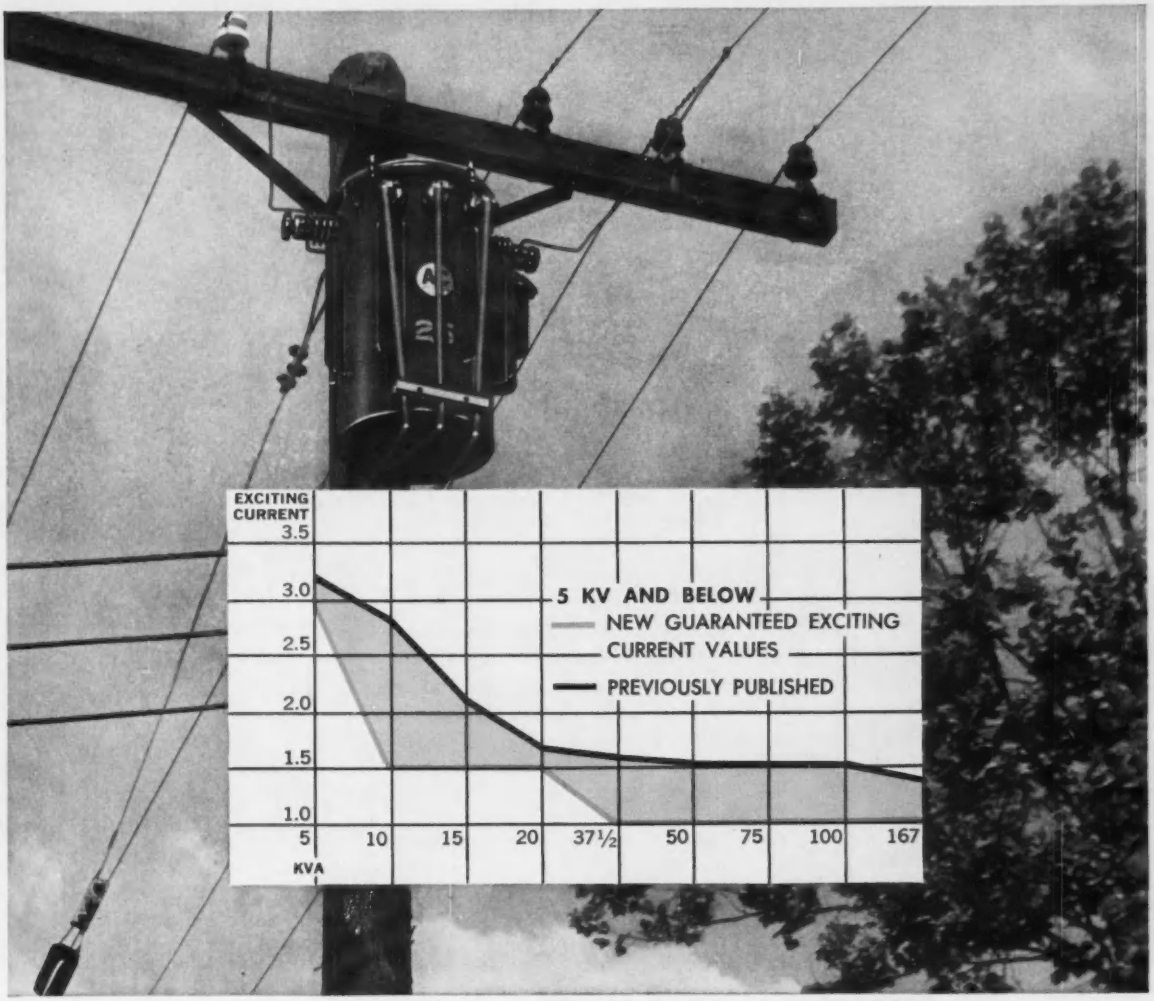
Perhaps the most unique item in the mobile lighting clinic was the fascinating and almost unbelievable display of Etzon—the flexible fluorescent lighting product which employs a small high frequency generator to excite a multitude of small glass phosphor-coated ampules nestled in a transparent plastic garden hose. The relative indestructibility of this light source, in addition to its versatility of application, makes it extremely useful.

To publicize the tour, 20,000 invitations were mailed to the most prominent merchants in our system. Newspaper publicity preceded the show in each city. Special "flyers" were sent by direct mail to remind the merchants and office managers of the approaching show date.

The results of our travelling Lighting Road Show indicate a desire of businessmen to know more about light and how it can help them in their desire for greater sales and higher profits.

ALLIS-CHALMERS

A-1253



More revenue-producing power for you

with Allis-Chalmers distribution transformers

Exciting current cut as much as 50%! No small figure whether you consider it by the unit or by the system!

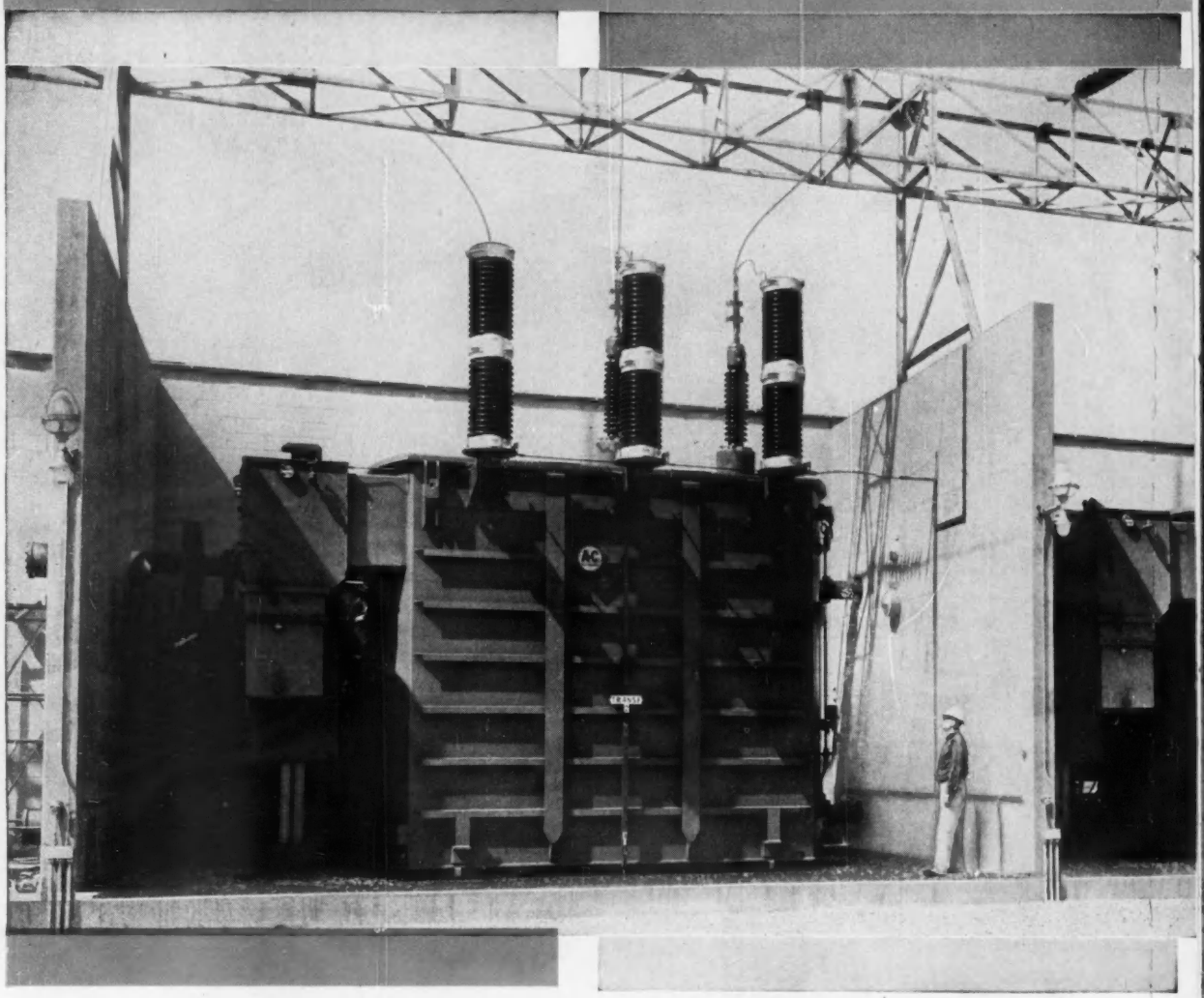
It's all a matter of efficiency. And the published curves above show how much more efficiency you get with Allis-Chalmers distribution transformers.

Here's how it pays off for you. A-C units cut generating capacity requirements. Just a bare minimum of nonrevenue-producing exciting current is needed. As a result, copper loss on transmission lines is reduced. And there's less demand for system power-factor corrective equipment. Now your system carries a higher amount of revenue-producing power!

Advanced research, development, materials and facilities are the keys to Allis-Chalmers continuing improvement program.

Your nearby A-C office has all of the revenue-boosting facts. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

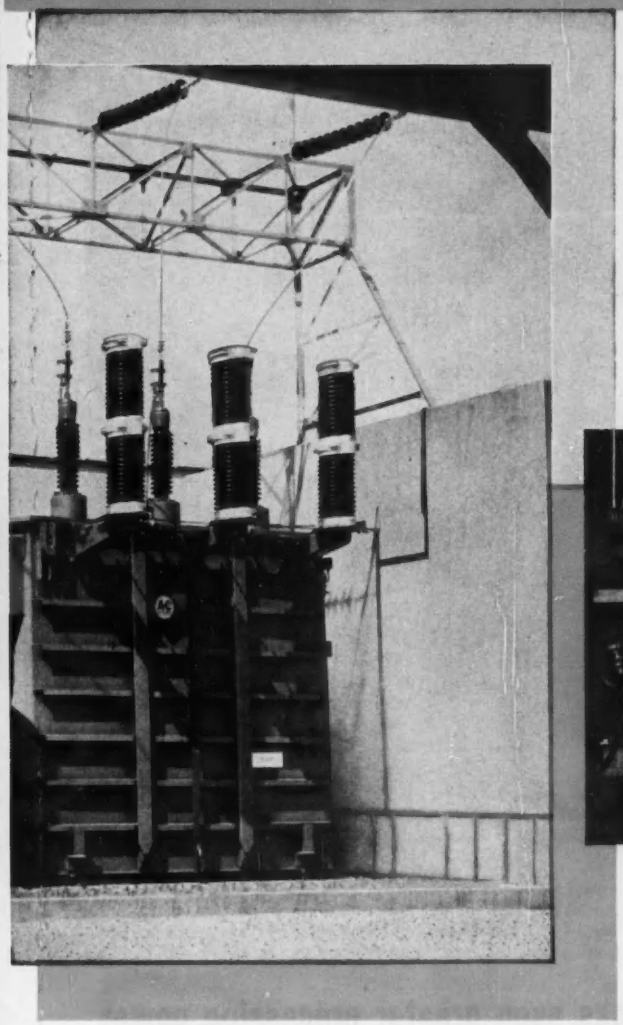
ALLIS-CHALMERS . . . Pacing



AT WISCONSIN ELECTRIC POWER COMPANY

Dual cooling takes the heat off emergency loads

*Patented



Manual shutoff valves serving transformer cooling equipment piping are opened when dual cooling is necessary. A transformer can be taken from service without draining the oil from the unit or its piping.

A-1155-E

Either of two 90-mva transformers is capable of carrying 2/3 of the combined capacity by using the "dual-cooled" feature

Wisconsin Electric Power Company counts on *designed-in* power transformer emergency capacity. Exclusive *dual-cooled* arrangement* uprates either one of the 90-mva transformers to 120 mva if the other is removed from the line.

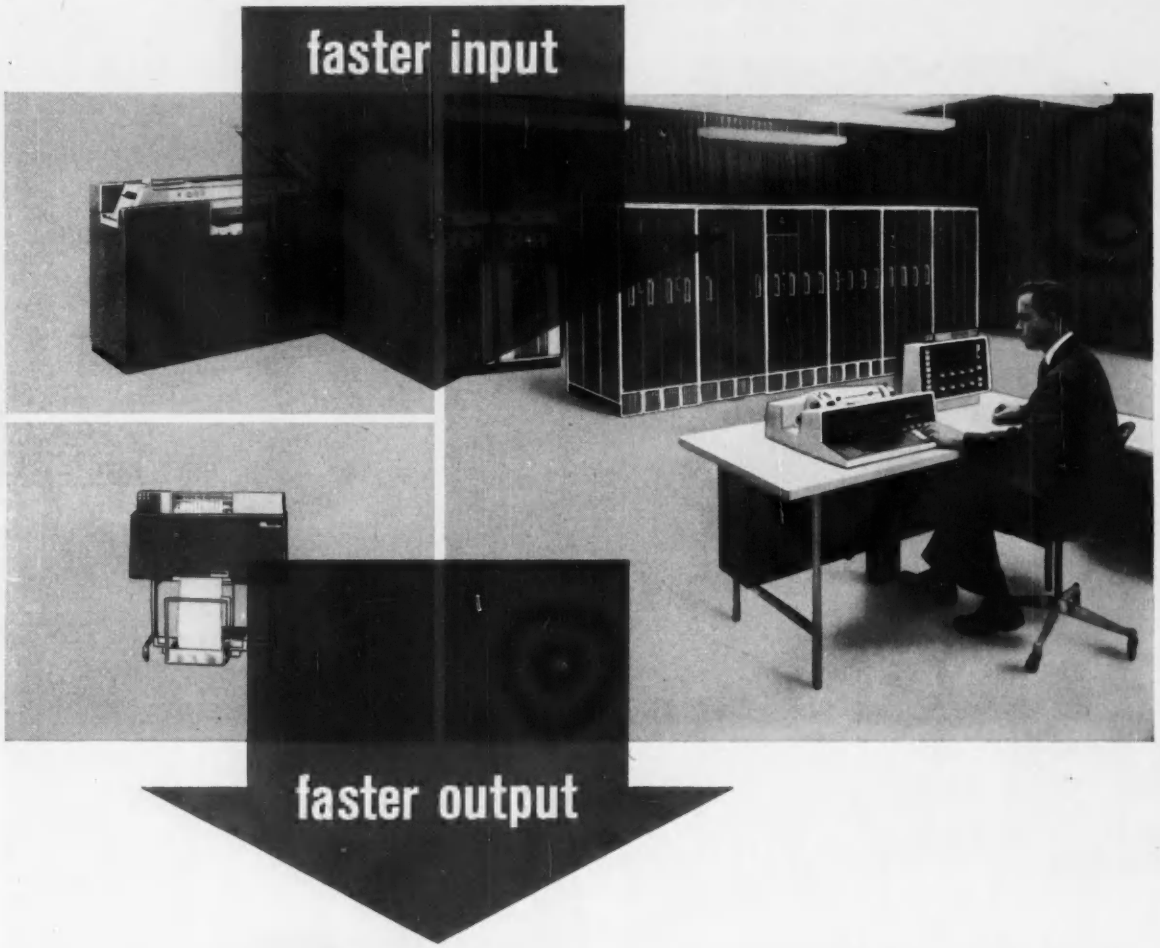
The active transformer utilizes all of the other unit's oil-to-air cooling equipment to dissipate heat. In normal operation, each transformer uses its own coolers independently.

Stepping down 138,000 volts to 13,800 volts, the transformer bank employs accordion-type expansion joints between transformers. Header pipes allow for manual cutoff. The installation has been designed to permit adding a third transformer should demand require it.

Dual cooling is but one of many A-C advantages resulting from continuing transformer research. Others include corona-free design, quiet operation, reduced size and weight, high short-circuit strength. A call to your A-C man will bring further dual-cooling power transformer details.

ALLIS-CHALMERS A-C *POWER FOR THE FUTURE*

with IBM's new, high-speed 1401 System for



... the powerful IBM 7070 now packs even greater processing power

Greater flexibility in putting your problem on computer . . . greater speed in taking results off . . . greater flexibility in handling peripheral operations—these are the features that IBM's exciting new 1401 System brings to the IBM 7070. The 1401 balances input/output speeds to match the tremendous processing speed of the 7070, adds powerful off-line editing and programming facilities to free the computer for more profitable work. The total system—designated the tape-oriented IBM 7070—gives you lower job cost . . . more production per dollar.

The tape-oriented 7070 employs the 1401 System to boost card-to-tape conversion from 500 to 800 cards a minute. The 1401 also features an exclusive horizontal chain printer that turns out crisp, perfectly aligned copy at 600 lines a minute. This unique printer moves paper at magnetic tape speeds—up to three and a half times faster than conventional printers!

With these advances comes unusual flexibility. The tape-oriented IBM 7070 is a solid state, high-capacity system. It can be expanded from a single-channel 4-tape to a four-channel 40-tape system. It can read on one to four channels simultaneously with computing. And in keeping with IBM's concept of Balanced Data Processing, the 7070 is linked with comprehensive services ranging from personnel education and program planning through reliable service engineering.

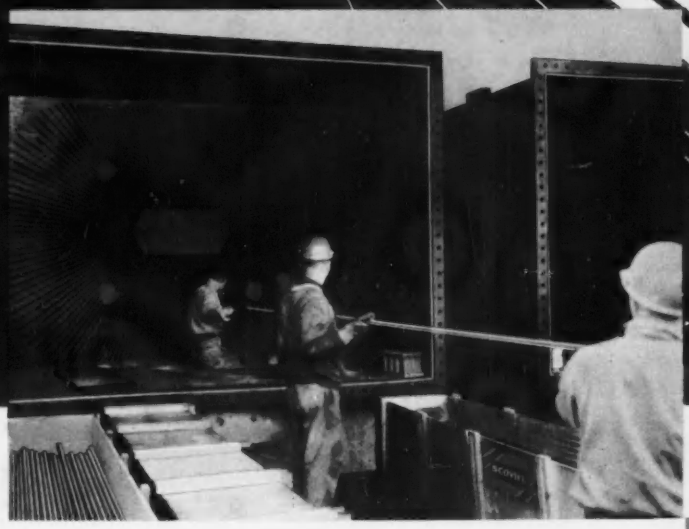
For full information on the new tape-oriented 7070 call your IBM representative. Like all IBM equipment, the 7070 System may be either purchased or leased.

IBM®

BALANCED DATA PROCESSING

YANKEE ATOMIC

trouble-free performance



installing more
than 70 miles of

SCOVILL®

INHIBITED ADMIRALTY

heat exchanger

TUBE

HEAT EXCHANGER TUBE for Applications from Marine to Petrochemical, from Compressor Intercoolers to "Cat-Cracker" Exchangers, in these popular Alloys . . . Phosphorized Admiralty • Admiralty • Arsenical Admiralty • Red Brass, 85% • Deoxidized Copper • Arsenical Copper • Cupro-Nickel, 10%-20%-30% • Aluminum Brass • Aluminum Bronze, 5% • Muntz Metal • Duplex Tube

HIGH RELIABILITY . . . trouble-free performance . . . has become a very specific goal of engineers in the Atomic Age.

This applies whether the problem is reliability of controls in a space vehicle or reliability of the operating equipment in New England's first Atomic Power Plant at Rowe, Massachusetts, being designed by Stone & Webster Engineering Corporation in collaboration with Westinghouse and constructed by Stone & Webster.

Scovill salutes the Yankee Atomic Electric Company's project, where 11 future-minded New England Utilities have set a new milestone in a field of unlimited promise.

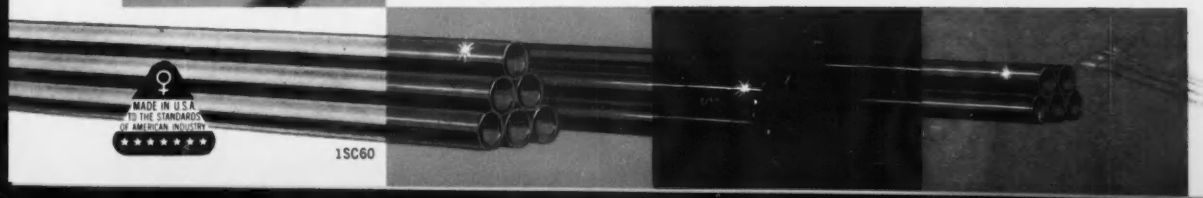
Scovill's contribution is HEAT EXCHANGER TUBING . . . mile upon mile of precision-built tube that shoulders a major responsibility for the trouble-free operation of this installation.

Here are shown being installed some of the more than 12,000, 30-ft. long Scovill Inhibited Admiralty Tubes (⅞" OD X .049" wall) specially made to extremely tight specifications for the main condenser in the Yankee Atomic Electric Company plant . . . over 70 miles of tube, every foot of which has passed the most rigid inspection.

Here, as elsewhere, Scovill Heat Exchanger Tube alloys and Scovill Technical Services have been recognized as among the finest available . . . to assure trouble-free performance.

SCOVILL

SCOVILL MANUFACTURING COMPANY
Mill Products Division, 99 Mill Street, Waterbury, Connecticut. Phone PLaza 4-1171.



MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

1SC60

short term vs. the long look

No utility is about to lose interest in the invoice price of coal. But as the power needs . . . and the resulting coal needs for the next ten and twenty years shape up in every operating area . . . short term thinking is giving way, more and more, to the *long look.*

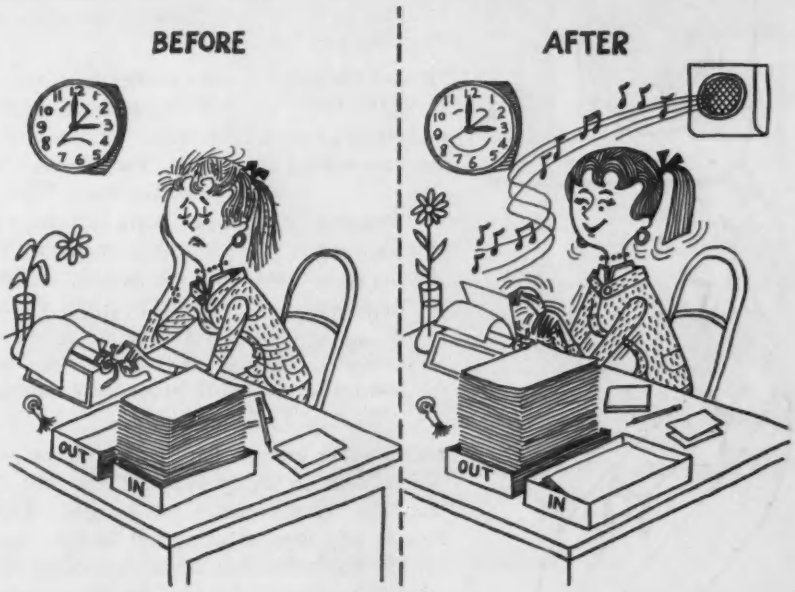
Utility engineers and purchasing agents are asking themselves and their coal suppliers some pointed questions: "Can we count on these suppliers to deliver the kind and quantity of coal we're going to need in the years ahead? Have they adequate reserves? Is this coal costing us over and above its invoice price in excessive coal handling, ash handling, equipment outages, freight charges on inerts? Or is it coal that eliminates these frequently overlooked incremental costs, delivers highest operating efficiency and steam at the lowest cost?"

The answers you'll get to such questions from Island Creek are the kind that let you plan ahead with confidence. Our engineers would welcome a chance to sit down with yours for a thoroughgoing discussion. Write, wire or phone.

You can depend on Island Creek . . . a career company dedicated to coal

ISLAND CREEK
Precisioneered Coal

ISLAND CREEK COAL SALES COMPANY, Chafin Building, Huntington 18, West Virginia • Chicago • Cincinnati • Cleveland • Detroit • Greensboro • New York • Pittsburgh



How About Music in the Office?

Report on
Employee Relations

Background music is one of the least expensive of all the management aids for increasing productivity. Many companies, over 20,000 of them, now believe music in the office goes hand in hand with good lighting, attractive surroundings and air conditioning to create a pleasant environment for their employees. And some of the best known electric utilities are included in this number. Still, results can't be guaranteed. In some companies, music has increased productivity 20% or more. In others, it has had little effect. Has music worked out in the utilities? Here's how executives in three power companies feel about the music systems they've installed:

"During the past month our work, in general, has been smoother than any month I can recall since this department was organized in September, 1936," one utility executive remarked after music had been installed. "It reduces the monotony and boredom, especially of the routine and detail jobs, and seems to reduce fatigue, resulting in increased efficiency," remarked an executive of another power company. And another executive in an Eastern utility said, ". . . it has been a profitable investment even though it is difficult to measure precisely the benefits derived."

It's difficult, in many cases, to prove background music actually increases output. A group of employees seldom produces at a constant rate; office output fluctuates from 10% to 20% with changes in the weather, illness, changing attitudes, and many more factors. Furthermore, music's effect can only be measured during the first few months after the service is begun. After that, further improvements may well be due to improved management or outside forces. Then too, output often shows steady—but sometimes unnoticed—improvement over the years anyway, and there is every reason to expect the trend to continue during a music trial period (notice the trend in the Mississippi P&L charts on the inside pages). Finally, the very fact that employees know they are being watched for their reactions during a music trial period may make them more productive (a common occurrence, psychologists term the Hawthorne effect).

Music affects employees by reducing nervous tension. The effect, of course, varies from person to person, but in general it stems from a more pleasant working environment. This, in turn, improves employee attitudes, morale and job interest—leading to higher production with fewer errors.

One of the first scientific studies into music's effect on production was done in England, by Wyatt & Langdon, in 1937. Their findings have since been picked up by most of the music services as a rough outline for the way they do business and sell their wares. They found, first, that music can increase production in many cases. Second: Too much music can be worse than no music at all. In other words, music itself can become a source of boredom. On an eight-hour shift, music shouldn't run for more than 3½ to 4 hours. Third: Not all music is beneficial. Some types are actually distracting, and slow down production. A juke-box will not increase efficiency in an office; the music is full of "gimmicks," tricky changes in tempo and instrumentation made for the sole purpose of attracting attention. To be effective, background music should be heard, not listened to. It should be specially recorded for the job.

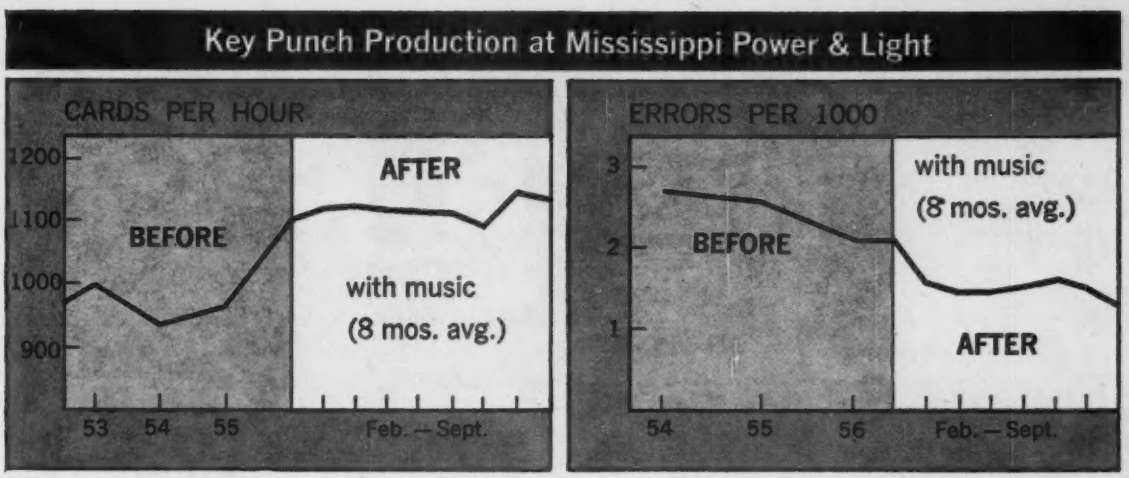
Music works best on the routine, monotonous jobs such as clerical work, in which attention easily strays. These jobs simply require less mental ability than the average person has to give. This idle ability soon gets to work though, and daydreaming, trips to the water cooler, and chatting, soon take the place of production. Music, by occupying at least some of these idle hours, takes the edge off the tensions that monotony and boredom create. Higher output and fewer errors are often the result. But for creative work music can be a detriment. Background music is definitely not recommended for the average executive's office, although some executives do like it—at least in modest doses.

There are two kinds of music services to select from. One is an outside service, originating in a central studio, with music transmitted over telephone wires or by FM radio. The other choice is a self contained unit in the company itself, either a record changer or tape recorder. These generally can be leased or purchased outright.

The outside services are the most popular, with MUZAK far and away the most widely used. Almost any company in a city of over 25,000 should be able to buy a "piped" music service from one or more of these companies. Some of the music services, such as MUZAK, offer outfits complete with amplifiers and speakers. Some others offer the music only, leaving it up to the company to install the hardware.

In-plant units are available to companies that want them. They have the disadvantage of requiring an operator to stack records or change tapes, but many companies would rather control their music programming, and don't consider that a disadvantage. The big drawback of these units seems not to be the time required to service them (most are at least semi-automatic) but in the music they play. Most of the outside services have their music especially recorded for office background playing. So, too, do many of the on-premises manufacturers. But with an on-premises unit the number of selections is definitely limited. The large outside services, by contrast, may have music libraries of 5000 selections, or more.

Many of the music services program their music "scientifically." Some, such as MUZAK and Music of Distinction, even vary the tempo of the music to counteract the "energy valleys" of the audience. The tempo is bright and cheerful in the morning. It then builds up to a peak intensity around 10:30 am—



Source: MUZAK Corporation

the mid-morning slump. Then in the afternoon there is still another peak, this time at 3:00 pm, during the mid-afternoon slump.

How Has Music Worked Out in the Utilities?

Mississippi Power & Light Co installed music in its machine accounting and billing section in February, 1956. Within weeks the keypunch operators were turning out more cards per day than ever before. Furthermore, errors were reduced substantially and the whole billing operation was speeded up.

- **Keypunch production rose** from a 1955 average of 971 cards per hour to an average of about 1120 cards per hour during the first eight months with background music. This is a 15.4% production increase.

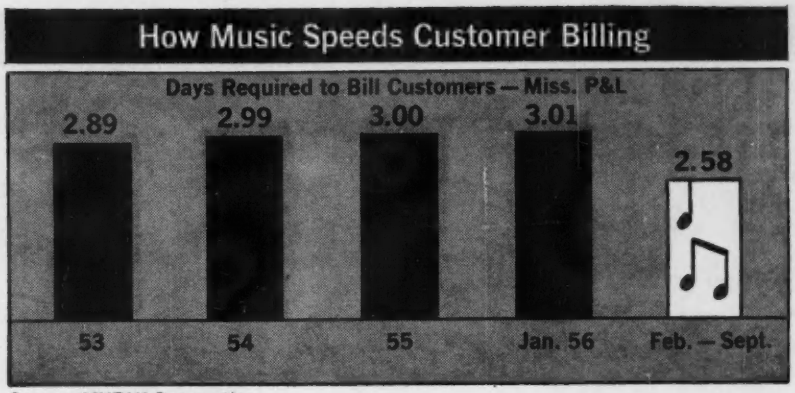
- **Keypunch errors dropped** about 34% after music was installed, from an average of 2.35 errors per 1000 cards in 1955 to an average of 1.55 errors per 1000 for the first eight months with music.

- **Time to bill customers dropped about 14%.** Since 1953 the department had shown a steadily lengthening time-lapse between receipt of meter books and actual customer billing. By January, 1956, the lag was averaging 3.01 days. During the eight months after music was installed the average had dropped to a new low of 2.58 days.

"Music doesn't automatically increase production," C. B. Roper, manager of the department, told Electrical World. "It simply puts our people in a pleasant frame of mind so they do a better job." Since 1956 MP&L has extended music into general accounting and the local office building.

The customer billing department at Public Service Electric & Gas Co employs about 260 people. In 1954, Roy Clement, department manager, decided to experiment with music. For a stern trial, he selected the machine billing department, which employs 46 persons. The noise level in the department is so high that normal conversation is impossible. The MUZAK company agreed to a 30-day free test, and installed the speakers.

At the end of the trial month there were measurable (but tentative) results. Billing clerks were turning out more bills per hour, and were doing it with fewer errors. Absenteeism also declined. The results were so successful that the entire department was wired for music, and employee reactions were overwhelmingly favorable. Public Service later bought the speaker system from MUZAK, and now pays only the service charge of $55 per month for the music itself.



Source: MUZAK Corporation

Both Mississippi P&L and the Public Service Co are satisfied with their music systems, but they are also cautious about making extravagant claims for music's success. In fact, the attitude of most companies seems to be that music is inexpensive and a good thing for employee morale, and can be justified on that basis. This sensible attitude runs counter to the claims of some music system salesmen. Music is not always the widely-accepted thing they would have us believe. This was brought out in an Electrical World spot survey in one utility office that had a music installation. The employees generally favored music while they worked. But over half of those questioned had one complaint or another. For example:

• **Employee "A"** (male, 4 years service) "They don't change the records often enough. It all sounds the same, after four years you can almost tell what's coming next. Some people always complain about it being too loud, so they turn it down and then no one can hear it."

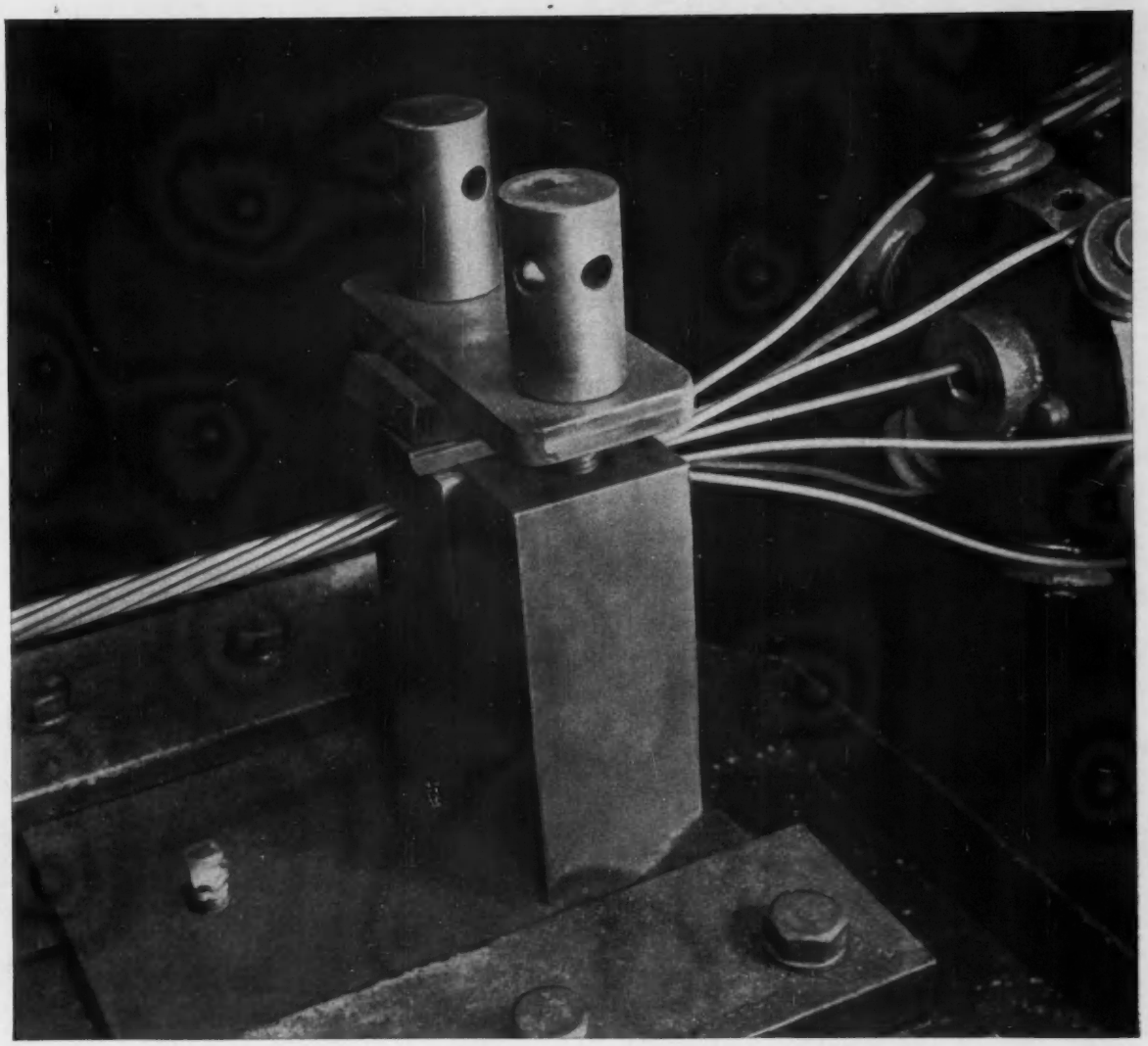
• **Employee "B"** (female, 2 years service) "I think they could use better quality music. Some of it is okay, but some of it sounds tinny. Sometimes I think I would be more relaxed if they would just shut it off, when they're playing that kind of music."

• **Employee "C"** (female, 13 years service) "I love it, it takes the monotony out of the work. But I wish there was more variety. Why don't they play some popular songs?"

• **Employee "D"** (male, 10 years service) "It makes the day go faster, but there's too much of it. I wish there was more variety, the songs all sound the same."

How Much Does it Cost?

There's not much difference in the cost of many of the music services. Thus, a decision on the one to use can be based on the quality of the music and the way it is programmed. It is difficult to quote prices directly, because they vary depending on the type of installation (a noisy plant needs more amplifiers than a quiet office). And the city where the service is bought makes a difference. The intense competition in Boston, for example, has pushed the cost for a wired music service for a small office down to about $18 a month, complete. But in Philadelphia, the same service would cost about $50. In any event, it's unlikely that the cost of music will be more than 1% of direct payroll costs, and it may be much less. At that rate, only the slightest production gain will more than pay for the cost of the music service.



Smooth, uniform coating assures smooth stranding ...when you use BETHANIZED ACSR Core Wire

Bethlehem's Bethanized ACSR core wire has a smooth, uniform coating which makes it ideal for high-tension wire. Bethanizing is our unique electrolytic process which tightly bonds pure zinc to the steel wire. It withstands the stranding and forming without injurious flaking or peeling of the zinc armor.

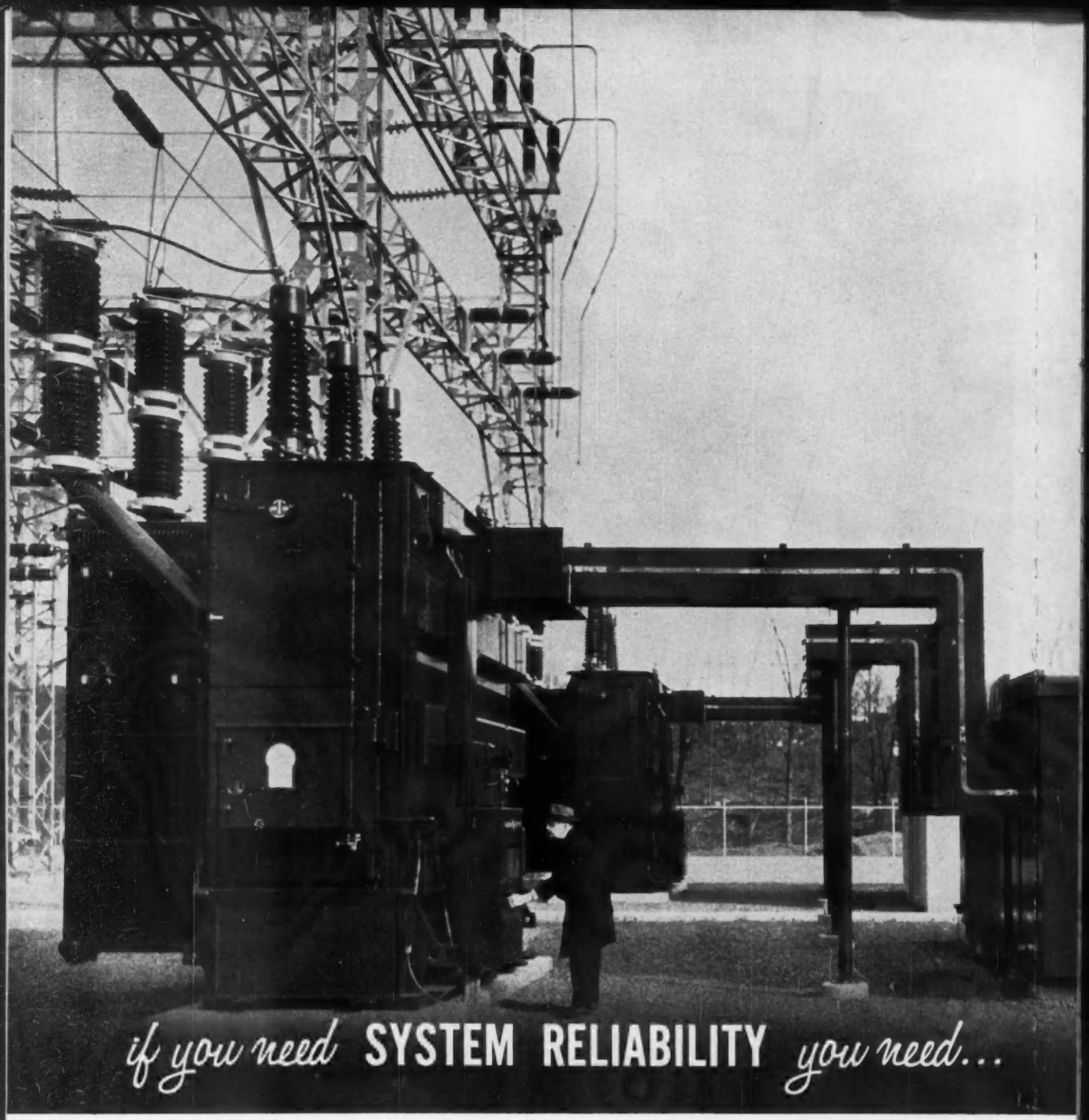
Manufactured to meet the latest ASTM specifications, Bethlehem ACSR core wire is available in three weights of bethanized coatings: standard (A), heavy (B), and extra-heavy (C). Usually furnished in sizes from 0.1878-in. to 0.0661-in., it is shipped in coils of one continuous length. Coil weights are in accordance with ASTM specifications.

Just phone your nearest Bethlehem sales office for full information on any of your wire needs.

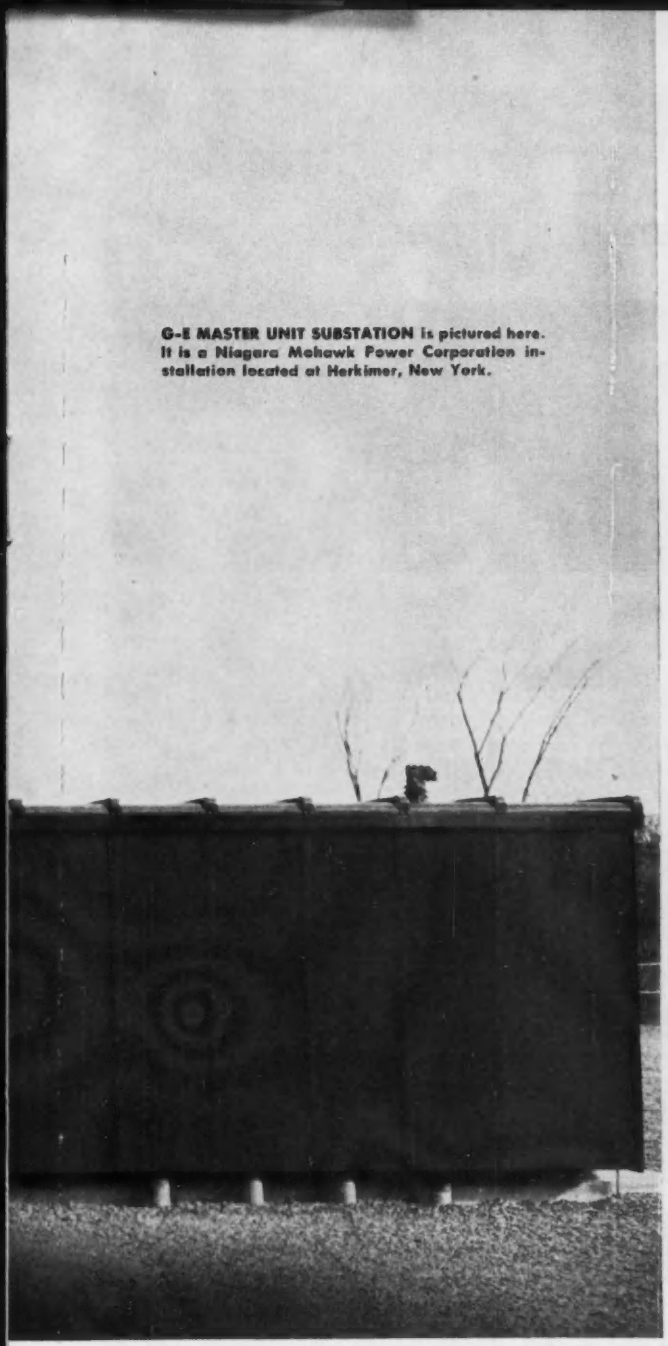
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

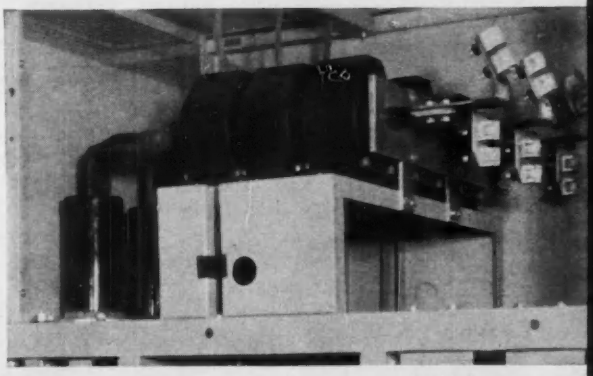


COORDINATED General Electric Master Unit Substations



G-E MASTER UNIT SUBSTATION is pictured here. It is a Niagara Mohawk Power Corporation installation located at Herkimer, New York.

COORDINATED manufacturing skill, developed through years of pioneering in the electrical industry, is a vital ingredient of every G-E master unit substation.



COORDINATED components such as butyl-molded current (shown above) and potential transformers are another key to improved station performance.

COORDINATED testing at modern switchgear and transformer laboratories helps assure coordinated master unit substations, designed for top system reliability.

Today, system reliability is a frame of reference against which other considerations—price, delivery, installation—must be placed when distribution equipment is involved.

At General Electric, the challenge of increased system reliability is being met by designing completely coordinated master unit substations to fit individual system requirements.

This coordination takes many forms:

- **Coordinated Manufacturing Skills** mean that transformers, switchgear and other components are engineered by experts; manufactured by craftsmen for top system reliability.
- **Coordinated Components,** specifically designed to complement each other, afford more reliable transformation and fault current protection.
- **Coordinated Design Testing** puts all master unit substation components through their paces under duplicated field conditions.

When you evaluate your substation plans, be sure to consider reliability inherent in system coordinated G-E master unit substations. For more information contact your G-E Apparatus Sales Office or write for bulletins GEA-3800D and GED-4052, General Electric, Schenectady 5, N. Y. 512-33

Progress Is Our Most Important Product

GENERAL ELECTRIC

News About People

AEP Names Cook, Kammer, Turner Directors

Donald C. Cook, H. A. Kammer and Harold Turner have been elected members of the board of directors of American Electric Power Co. All three are executive vice presidents of American Electric Power Service Corp, a subsidiary company.

COOK KAMMER TURNER

Cook is executive vice president for legal, finance and accounting matters. He joined the Service Corp in 1953 as a vice president and was elected executive vice president in 1954. He has also served with the Department of Justice.

Kammer is executive vice president in charge of engineering and construction. He joined AEP in 1924 as an assistant design engineer. He subsequently became structural and construction engineer, design and construction engineer, and, in 1950, vice president.

Turner, executive vice president for operations, directs the operating and sales activities of the System companies. He joined AEP in 1926. In 1941, he was named assistant general manager of Ohio Power Co, and in 1946 became its vice president and general manager. He returned to New York as executive vice president of the Service Corp in 1954.

Margraf Elected VP of Reynolds Metals

Gustav B. Margraf, general solicitor of Reynolds Metals Co, has been elected a vice president.

Margraf, who has been with Reynolds since 1955, has been a director since April, 1959.

From 1948 to 1955 he was a vice president and general attorney for the National Broadcasting Co. Prior to that, he was with the law firm of Cahill, Gordon, Reindel and Ohl in New York and Washington for nine years.

Buffalo Forge Names Dillaway and Schively Vice Presidents

DILLAWAY SCHIVELY

Theodore M. Dillaway has been named a vice president and George P. Schively, vice president of manufacturing, of Buffalo Forge Co. Dillaway continues as a director and secretary, and Schively as a director.

Dillaway joined Buffalo Forge in 1940, and was elected secretary and a director in 1958. He has been a director of Canadian Blower & Forge Co since 1953, and of Canada Pumps, Ltd, since 1958. Both are Buffalo Forge subsidiaries.

Schively joined the company as general superintendent, became plant manager in 1951, director of manufacturing in 1955, and was elected director in 1959.

(*More News About People on page* 154)

New ORANGEBURG® CA* CONDUIT *with Flush Coupling Attached!*

With no separate couplings to handle or attach on the job, Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2° male taper at the other end, making installation a simple, one-step operation. And, since the coupling *is* attached, there are no coupling cartons to warehouse or carry to the job.

What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time.

Like the hundreds of millions of feet of Orangeburg fibre conduit in use since 1893, new CA has self-sealing joints and impermeable walls. Its smooth, 100% fibre raceway adds years to cable life.

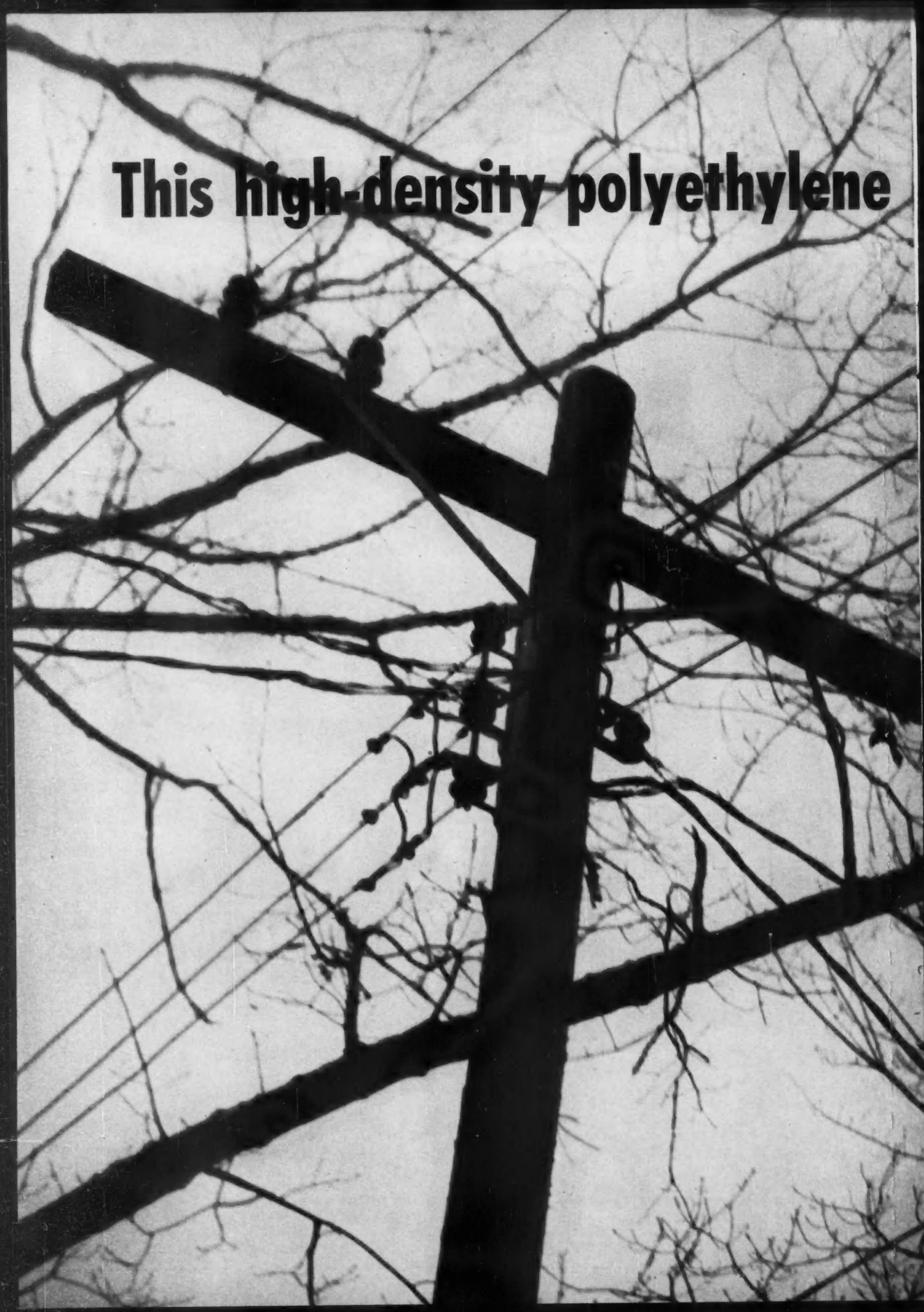
New Orangeburg CA is available in 2", 3", 3½", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. **EW-20** for Catalog 52.

ORANGEBURG MANUFACTURING CO.
Orangeburg, New York

Division of The Flintkote Company, Manufacturer of America's Broadest Line of Building Products

FLINTKOTE

Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.


This high-density polyethylene

wears down tree limbs!

That's an indication of the abrasion resistance you find in BAKELITE Brand high-density polyethylene DGD-4100. In standard IPCEA tree wire abrasion tests, it withstood over 1,500,000 cycles . . . 50% better than other high-density polyethylenes tested! For utility companies, coverings of DGD-4100 mean less damage from trees and reduced outages.

In resistance to environmental and thermal stress cracking, DGD-4100 surpasses most high-density and conventional polyethylenes. These properties, along with improved toughness, shear strength, and weather resistance are attained without sacrifice of such familiar polyethylene advantages as light weight, excellent electrical insulating properties and ease of pull over cross-arms.

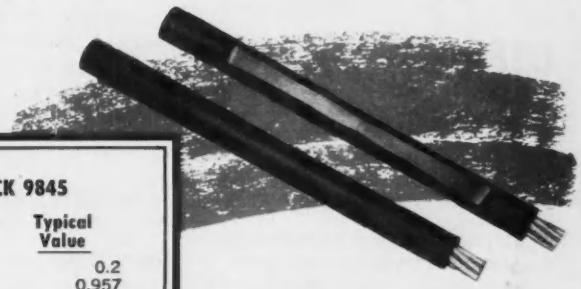
Progressive utility companies are already switching to BAKELITE high-density polyethylene. DGD-4100 has proved especially well-suited in power distribution systems for service drop and tree wire covering, as well as in line wire, aerial spacer cable and high-voltage power cable.

Test data and samples will tell you more about what BAKELITE Brand high-density polyethylene DGD-4100 can do. Write Dept. BG-40H, Union Carbide Plastics Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. *In Canada:* Union Carbide Canada, Toronto 7.

TYPICAL PROPERTIES "BAKELITE" DGD-4100 BLACK 9845

Properties	ASTM Test	Typical Value
Melt Index @ 44 psi (gms/10 min)	D 1238	0.2
Density	D 1505	0.957
Tensile Strength, psi	D 412	3400
Per Cent Elongation	D 412	250
Durometer Hardness, Shore Type "D"	D 676	58
Brittleness Temp., °C.	D 746	-95
Shear Strength, psi	D 732	3000
Stiffness in Torsion, @ 23°C., psi	D 1043	100,000
Tree Wire Abrasion Test	(1)	
50% Abraded (Cycles)		800,000 ca.
100% Abraded (Cycles)		1,500,000 ca.
Environmental Stress Cracking, F_{50}, hrs.	D 1693 (2)	500
Thermal Embrittlement Resistance, hrs. @ 70°C., F_0	(3)	5000
Deformation at 110 deg. C., per cent	(4)	0
Dielectric Constant	D 1531	2.65
Dissipation Factor	D 1531	.004
Dielectric Strength, Short Time, volts/mil	D 149	580

(1) IPCEA Tree Wire Test — S1981
(2) Samples previously aged 7 days @ 70° C.
(3) Standard U/L Heat Shock Test — 1/32" insulation on #14 AWG solid copper conductor wrapped around its own diameter.
(4) UCPC Method WC 75 B/3—1/32" wall on #14 AWG wire. Test terminated at 5000 hrs.

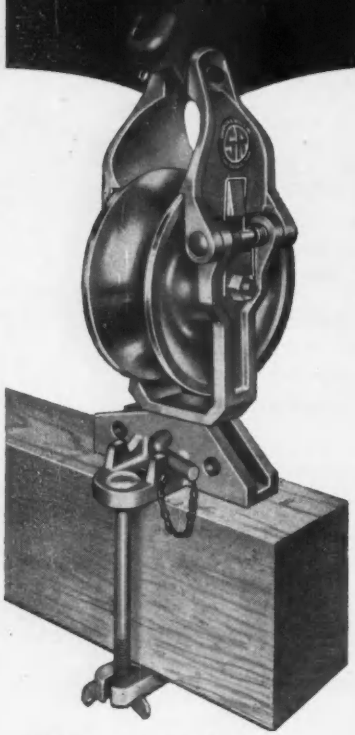


Samples of tree wire insulated with DGD-4100—before and after 1,500,000 abrasion cycles.

UNION CARBIDE

"Bakelite" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

S&R Universal Stringing Sheave
MODEL XS-100



USE on CROSSARM as shown

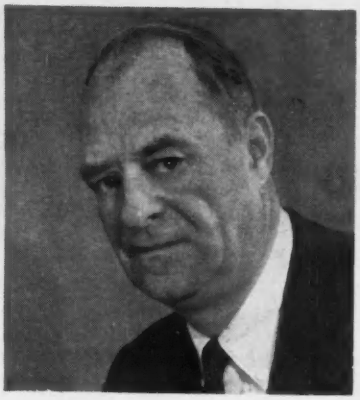
USE on ANGLE for cornering block

USE without BRACKET to suspend from insulator stringing

Light weight, adjustable bracket, tough aluminum alloy throughout, safety locking, wide throat and anti-friction bearings. Grooved for cable through 1 ¾" diameter. Designed especially for ACSR.

NEW CATALOG
on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY, INC.
ENGINEERS AND MANUFACTURERS
CHATTANOOGA 2, TENNESSEE
Telephone AMherst 7-1273
TWX CT-7036



Sharkey Named Manager Of Ebasco Department

T. L. Sharkey (photo above) has been named manager of the rates and pricing department at Ebasco Services, Inc. He succeeds Robert S. Quig who was named coordinator of the departments in Ebasco's Management Consulting Division. Louis Johnson has been made assistant manager of the rates and pricing department.

Before joining Ebasco in 1951 as a senior rate consultant, Sharkey was assistant rate engineer of Potomac Electric Power Co. Quig has been with Ebasco for 29 years. Johnson, with Ebasco since 1952, had previous experience with Ford, Bacon & Davis as an electrical engineer, and M. W. Kellogg Co as a design engineer.

PERSONAL BRIEFS

Henry B. Roach will become advertising and publicity manager of Oklahoma Gas & Electric Co on March 1, replacing **Paul Hoheisel** who retires on that date.

Everett L. Palmer, public relations vice president of Pennsylvania Power & Light Co, has been elected to the board of directors.

Cleveland Electric Illuminating Co has promoted **Willard J. Pugh Jr** to general supervisor of the industrial development section, area development dept. **Donald E. Williams** has been made manager of office building service department; **William R. Vogelsang,** secretary; and

(*Continued on page* 156)

*Trademark

"Superforms* sure fill the bill for a STANDARDS ENGINEER!"

"Fanner Superformed products meet our standards all along the line . . . *technical superiority, accurate manufacture, uniform quality, dependable performance.*"

More and more Standards Engineers . . . *the men who must find BETTER ways to do things BETTER* . . . are testifying that Superforms meet the highest standards. A-1580A

FANNER *Superformed* with a **"PROTECTIVE TWIST"**

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

WAGNER Dry-Type *General Purpose* Transformers

...WHISPER WHILE THEY WORK

New... from Wagner... totally enclosed dry-type transformers *filled with epoxy compound.* Their designation: Type AE Single Phase, 1 to 10 Kva.

Use these transformers for all general purpose applications, including those where noise must be minimized. They have a low sound level... the result of encasing smaller Form W core and coils in solid epoxy compound. The compound insulates, reduces sound-producing vibration caused by core excitation ... and provides enough support and mechanical strength to eliminate the need for metal framework and other subassemblies that are subject to vibration. *The result:* a whisper-quiet transformer that can be used anywhere, even in quiet areas of offices and hospitals.

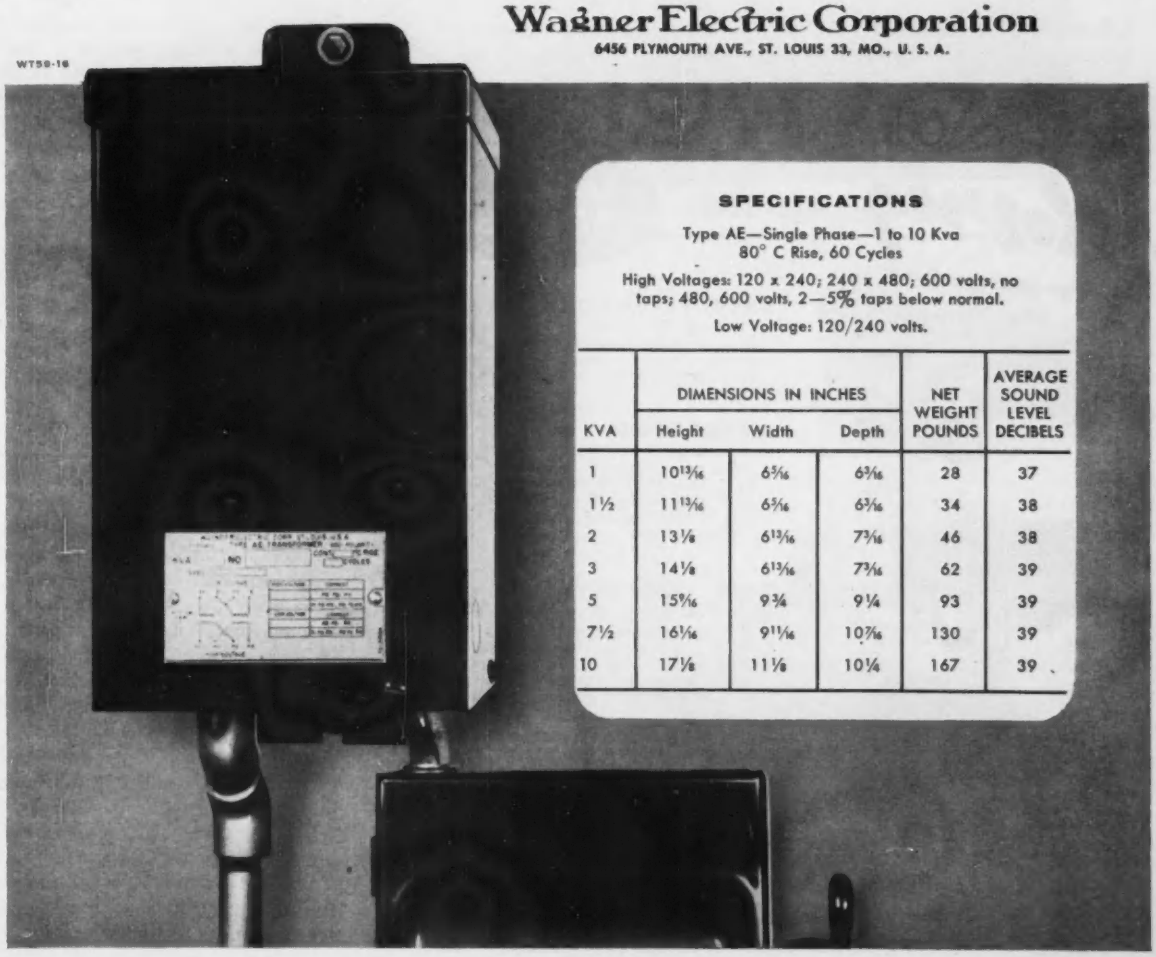
Wagner Type AE transformers do more than silence sound, of course. They improve voltage regulation, and have better insulation protection (suitable for continuous operation at 80°C in a 40°C ambient). All parts are sealed from dust, moisture and corrosion by the epoxy compound. Naturally, every unit is built to conform to all applicable standards of ASA and NEMA.

Wagner Type AE transformers can be installed indoors or out... in any location where they will not be submerged or exposed to injurious fumes in concentration. They are compact and lightweight and can be mounted in any position, at any angle... on walls, floors, or ceilings.

Like to know more? Wagner branches and distributors have all the details. There's one near you. Call or write now.

Wagner Electric Corporation
6456 PLYMOUTH AVE., ST. LOUIS 33, MO., U. S. A.

WT59-16



SPECIFICATIONS

Type AE—Single Phase—1 to 10 Kva
80° C Rise, 60 Cycles

High Voltages: 120 x 240; 240 x 480; 600 volts, no taps; 480, 600 volts, 2—5% taps below normal.

Low Voltage: 120/240 volts.

KVA	DIMENSIONS IN INCHES			NET WEIGHT POUNDS	AVERAGE SOUND LEVEL DECIBELS
	Height	Width	Depth		
1	10 13/16	6 5/16	6 3/16	28	37
1½	11 13/16	6 5/16	6 3/16	34	38
2	13 1/8	6 13/16	7 3/16	46	38
3	14 1/8	6 13/16	7 3/16	62	39
5	15 5/16	9 3/4	9 1/4	93	39
7½	16 1/16	9 11/16	10 7/16	130	39
10	17 1/8	11 1/8	10 1/4	167	39

Donald B. Matthews, assistant secretary and assistant treasurer.

Tampa Electric Co has appointed **H. L. Culbreath Jr** comptroller.

Vincent S. Boyer has been appointed superintendent of the Peach Bottom atomic power station at Philadelphia Electric Co. The station will be completed late in 1963.

Portland General Electric Co has appointed **W. L. Tait,** manager, residential sales promotion; **Nick G. Mason,** manager, commercial and industrial sales promotion; **C. W. Jarrett,** manager of public services; and **J. T. Cottingham,** acting manager of the commercial sales section.

Clyde C. Scott, former nuclear systems engineer for Minneapolis Honeywell Regulator Co, has been named head of the electrical and instrumentation section for Atomic Power Development Associates.

Edward N. Applegate Jr, a line helper in the Camden area, electric distribution department, Public Service Electric & Gas Co, has been awarded the President's Medal of the National Safety Council. He earned it for successfully resuscitating a construction worker.

American Institute of Electrical Engineers has named the following to the grade of Fellow: **William R. Johnson,** chief electric generation and transmission engineer, engineering department, the Pacific Gas & Electric Co; **Leo A. Finzi,** Buhl Professor of electrical engineering, Carnegie Institute of Technology; **John W. Kalb,** director of electrical research, engineering department, Ohio Brass Co; **Irving D. Perry,** engineer, electric engineering department, Public Service Electric & Gas Co.

H. W. Slack and **M. C. Westrate** have been elected directors of Commonwealth Services Inc. Slack is a vice president of Commonwealth Associates, Inc, and Westrate is chief electrical engineer, assistant secretary and assistant treasurer.

Vice chairman of Worthington Corp, **E. J. Schwanhausser,** has retired.

These changes have been made at Westinghouse Electric Corp: **P. T. Lagrone** has been named assistant regional manager in the southeast, and **Harry E. Seim,** vice president in charge of the Sturtevant Division, has retired. **Clarence B. Campbell,** chief engineer of the Steam Division has been selected to receive the Gold Medal of the Newcomen Society in North America "in consideration of his many outstanding achievements in the utilization of steam for the benefit of mankind."

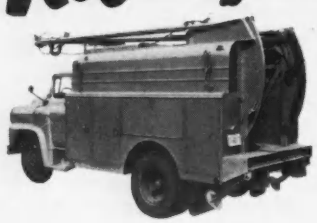
Whit Ridgeway has been assigned to the marketing department of the Turbine Division of General Electric Co in Schenectady. He will be responsible for turbine sales in the southeastern and western areas. **Henry A. Loughran** has been appointed manager of business systems and measurements, communication products department; **Eugene J. Grassie** has been named manager of the Minneapolis service shops; **Henry J. Chanon,** manager of the Carolina sales district of the large lamp department, and **George E. Burens** has been transferred to a special assignment in the company's consumer products group.

Robert E. Boian, former manager of the Live Better Electrically program, has joined *Reader's Digest* Magazine as a special representative covering the electrical appliance and manufacturing industry.

OBITUARY

Thomas R. Williams, 31, assistant secretary and assistant treasurer of Florida Power Corp . . . **Adam Kahler Backer,** 66, retired supervisor for the district offices of Baltimore Gas & Electric Co . . . **Samuel Joel Wilson,** 80, a director of Middle South Utilities . . . **Francis E. Hadzor,** 44, an engineer at Montona-Dakota Utilities Co . . . **Fred A. Culley,** 66, purchasing agent for Alabama Power Co . . . **James H. Green,** 65, president of Brewer-Titchener Corp . . . **J. Leo Welch,** 67, vice president in charge of operations for Niagara Mohawk Power Corp . . . **William E. Hamilton,** 75, retired partner in Sanderson & Porter, New York engineering firm.

Koenig ALL-STEEL UTILITY BODIES



LINE-CONSTRUCTION BODY

. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

SERVICE BODIES

. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

3-WAY DUMP BODIES

DUMP to the RIGHT, LEFT and REAR

All-steel welded bodies available in 8' to 11' lengths. The multistage telescopic hoist has a lifting capacity of 25,000 lbs. This is the ideal body for safe dumping under hazardous conditions . . . especially adaptable for windrowing and backfilling.

YOU CAN BE SURE OF QUALITY MATERIALS AND WORKMANSHIP WHEN YOU SPECIFY KOENIG PRODUCTS

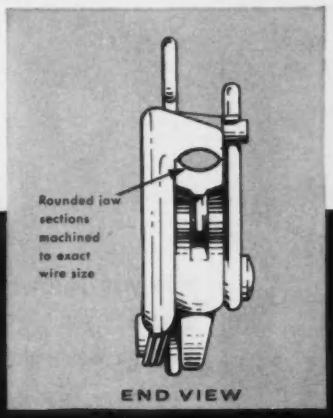
Write for literature and specific information today.

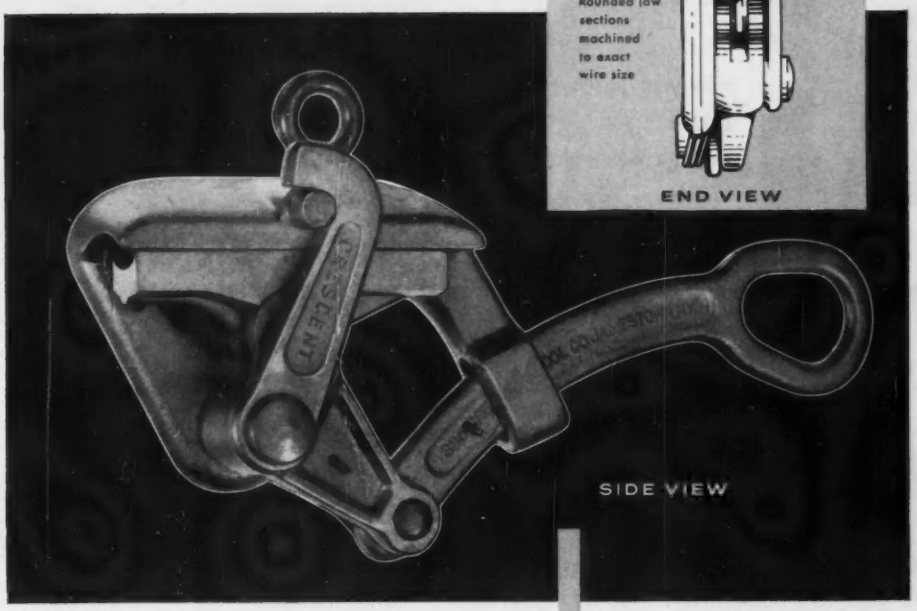
Koenig IRON WORKS, Inc.

P. O. BOX 7726
HOUSTON, TEXAS

CRESCENT ACSR GRIPS

GREATER GRIPPING POWER WITH MUCH LESS WEIGHT





Crescent Grips for large sizes of aluminum wire are now available in three sizes listed opposite. Instead of the conventional V-shaped jaws, these Grips have rounded jaw sections, machined to a specific wire size, and will not crush or distort the wire. This design also greatly increases gripping power since there is practically 100% contact between wire surface and jaws.

These grips have all the quality features which distinguish other Crescent Wire Grips . . . jam proof, easily released, individually pretested to their safe load capacity of 12,500 lbs . . . *and they weigh only nine pounds.*

No. 386-20 is carried in stock. The other two sizes are made upon special order requiring about 20 days. All are cadmium plated.

SPECIFICATIONS

No. 386-20
for 795,000 CM ACSR, 26/7 strand.

No. 386-30
for 636,000 CM ACSR, 36/1 strand.

No. 386-40
for 477,000 CM ACSR, 18/1 strand.

Safe Load
12,500 lbs (5600 KG)

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

"How your purchase dollars
return to you
through Westinghouse leadership"

A. J. Maslin, *Manager, Substation and Tap Changer Engineering*

New Triplex three-phase distribution regulator costs 30% less, uses 26% less pad space, cuts weight 39%

Now you can enjoy the true economies of a low-cost, three-phase feeder voltage regulator . . . with all the *time-proved capabilities* of the Westinghouse line of distribution regulators. In fact, Westinghouse uses three well-known URF regulators, gang-operated in a single tank to bring you these big savings. The new type SVR-FT regulator is completely automatic and self-contained. Available in 8.6- and 13.2-kv voltage classes.

The savings of standardized design are passed along to you in both initial cost savings and reduced operating costs. Savings of 30% and more. Answering the need for compact units, the SVR-FT requires only 49″ x 87″ of free area for a 500-kva regulator . . . 26% savings in space. This same unit weighs just 10,700 pounds . . . 39% savings in weight.

You also gain all the advantages that have been proved in hundreds of Westinghouse URF installations: continuous monitoring with the CVR inverse time delay relay, direct drive geneva tap changer, and 1¼%-step regulation. Check the picture captions for more details.

Call your Westinghouse sales engineer to learn more about the way your purchase dollars return to you through extra values such as the SVR-FT.

J-70937

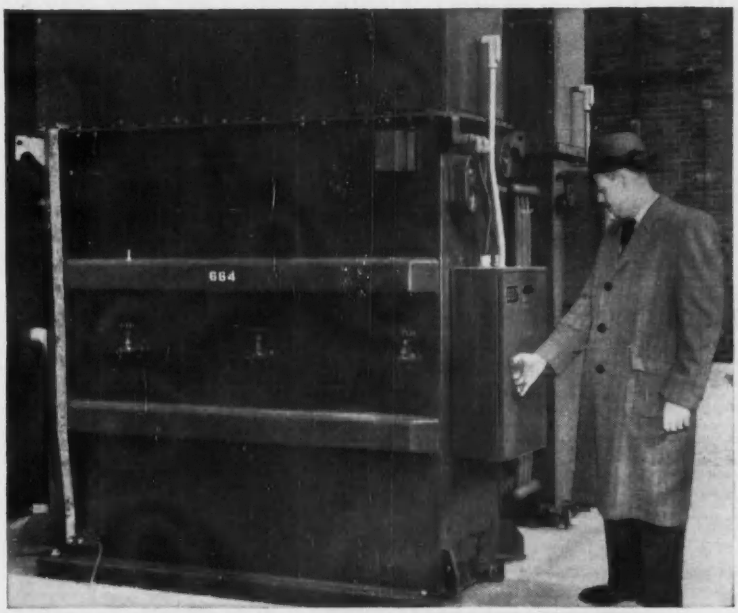
Continuous system voltage monitoring of the CVR relay provides faster correction of abrupt voltage changes . . . holds closer to set balance voltage.

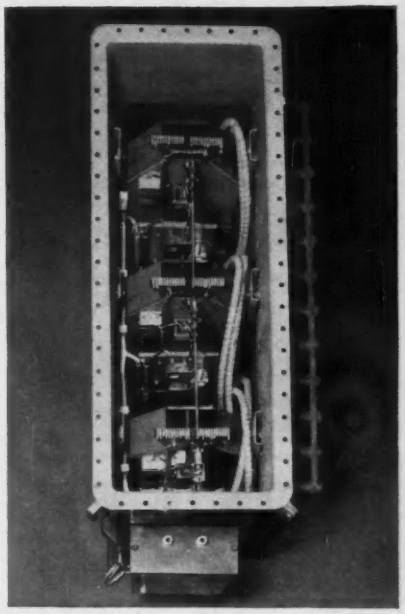
YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

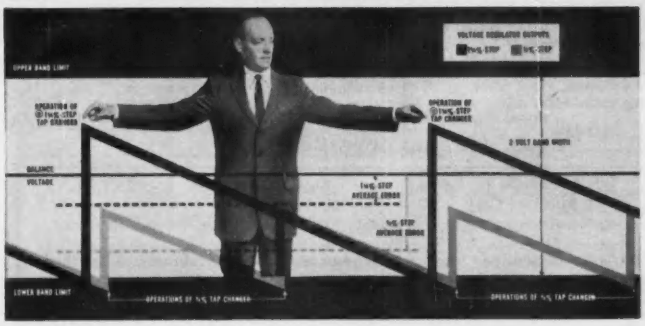
Instant-response tap changer corrects voltage 15 times faster. Requires only one second for 1¼% correction after relay operation; full buck to full boost in 13 seconds.

Mr. E. H. Carroll, Westinghouse representative, inspects the installation of this SVR-FT voltage regulator which offers a low-cost approach to three-phase regulation. Operating on the Oklahoma Gas and Electric system, the new regulator is completely self-contained.





Three single-phase units are mechanically interlocked . . . uniform tap positions assured. Units are interchangeable . . . can be removed without disturbing others. Separate tap changer compartments prevent contamination of main tank oil.


VOLTAGE REGULATOR OUTPUTS
UPPER BAND LIMIT
OPERATION OF 1¼% STEP TAP CHANGER
OPERATION OF 1¼% STEP TAP CHANGER
2 VOLT BAND WIDTH
BALANCE VOLTAGE
1¼% STEP AVERAGE ERROR
⅝% STEP AVERAGE ERROR
LOWER BAND LIMIT
OPERATIONS OF ⅝% TAP CHANGER
OPERATIONS OF ⅝% TAP CHANGER

Sixteen-step (1¼%) regulation provides narrowest *effective* bandwidth. There are 42% fewer operations than with any other three-phase regulator . . . less wear, longer life.

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Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU	KVA	MFR	VOLTAGE
1	12000	G.E.	115,000—46,000 L.T.C.
1	10000	West.	67,000—34,500, 3 Ph. Auto
3	5000	G.E.	72,000—2,300
1	3750	G.E.	69,300—13,200, 3 Ph.
1	3000	G.E.	69,000—4,340, 3 Ph.
3	667	G.E.	66,000—11,500/2300
3	500	G.E.	66,000/33,000—2300/13200
3	500	West.	66,000—11,500/2300
3	500	Wagner	69,000—460
1	2500	Mol.	44,000—2400/4160, 3 Ph.
2	2500	Wagner	45,800/22,900—4160Y, 3 Ph.
3	200	West.	44,000—480
1	5000	West.	34,500—13750/6875, 3 Ph.
1	4500	West.	33,000—2500/4330, 3 Ph.
2	3000	Upgf.	34,750—4160, 3 Ph.
1	2000	Kuhl.	34,650—440, 3 Ph.
2	1500	G.E.	34,400—2520, 3 Ph.
3	1250	A.C.	33,000—480
3	500	Mol.	34,500—2300/4600
3	200	A.C.	34,500—2400/7200/12740Y
3	200	Wagner	34,500—240
3	833	A.C.	26,400—480
2	2500	Wagner	22,900—4160/2400, 3 Ph.
2	1500	G.E.	23,000—2400/4800, 3 Ph.
2	3000	G.E.	13,800—2640, 3 Ph.
1	2500	G.E.	13,800—2400, Unit Sub.
3	1000	G.E.	13,800—600, L.C. Sub.
1	600	Stand.	13,200—2300, 3 Ph.
1	450	Penna.	13,200—2400, 3 Ph. Askarel
3	333	G.E.	13,200/22,800Y—2420/4190Y
1	1500	Wagner	6,900—480, 3 Ph. Dry
3	100	G.E.	7,200—240/480
3	100	A.C.	6,900—2400
1	500	Kuhl.	4,800—480, 3 Ph.
3	100	G.E.	4,800—120/240
1	1000	A.C.	2,400/4,160—240, 3 Ph.
3	400	G.E.	2,300/4,000—230/460

FEEDER REGULATORS, 3 PH.—OUTDOOR

1	500	G.E.	83.7A. 34,500 V. STEP
1	500	G.E.	694 A. 4,160 V. STEP
1	375	G.E.	50.2A. 34,500 V. STEP
1	250	A.C.	601 A. 2,400 V. STEP

Also: FREQUENCY CHANGERS, M-G SETS, SWITCHGEAR and CIRCUIT BREAKERS, ETC.

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& COMPANY, INC.
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Chicago 6, Illinois

ELEC. ENGINEER REA SYSTEM
IN CENTRAL ALASKA

Requires engr. with first rate utility and admin. experience. Should be versed on REA methods. Salary to $15,000.00 a year. Write to

MANAGER
GOLDEN VALLEY ELECTRIC
758 Illinois St. Fairbanks, Alaska

TRANSFORMERS

3—2500 KVA G-E 69000—2300Y
3—2500 KVA G-E 69000—2400/4160Y
3—2500 KVA G-E 69000—7200/12470Y
4—2500 KVA W-H 34500—2400/4800
3—1500 KVA G-E 69000—2300Y
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3—500 KVA Penn. 13200—120/240
3—333 KVA G-E 66000—2400/4160Y
1—750/938 KVA G-E 3-Ph. 33000—6900Y—TCUL equip. fan cooling
1—1000 KVA W-H 3-Ph. 33000—7200Y TCUL equipped

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio
47 Years' Dependable Service

RESIDENT SALES MANAGER

Electric Utility Company located in New England area has need for a Resident Sales Manager. Responsibilities include development and implementation of Company sales and sales promotion programs which will lead to increased sale of electricity for use in residences.

Successful candidate will have had experience which demonstrates managerial capabilities in areas of promotion and sales as well as general business administration, and will most likely be between 35 and 45 years old.

Please submit a complete resume detailing experience, education, civic and fraternal activities, and present and past income levels. Your present situation will be respected.

P-3812, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

LARGE POWER EQUIPMENT

Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?
BELYEA COMPANY, INC.
51 Howell St. Jersey City, N. J.
OL-3-3334

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. Box 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Wanted—Electrical Engineers. Minimum five years experience in public Utility Distribution. Transmission. Metering and Relaying. Required for permanent, responsible positions in Venezuela. Spanish an asset but not essential. Good living conditions. Starting salary of $13,000 per annum. P-3537, Electrical World.

Drafting Group Leader—Power Plant Electrical. Competent in supervision of design-drafting for both wiring and physical arrangements. Must be aware of economics of design-drafting and have proven ability to plan and follow through. Career job with engineering level compensation in established Chicago consulting office. Submit two copies of complete resume. P-3672, Electrical World.

SELLING OPPORTUNITY AVAILABLE

Representative wanted for manufacturer of street lighting equipment pole line specialties. Full particulars. RW-9821, Electrical World.

POSITIONS WANTED

Electrical Engineer—33—10 yrs. exp. design, construction, calculations, supervision of construction, management of electrical personnel, operation, in diesel electric power plants, switchgear, relays, motor control, power transmission and distribution, overhead and underground, lighting, substations, heating and ventilating, industrial buildings, industrial controls, some piping, and estimating. Desires work with aggressive, growing electrical contractor, consultants, electric utility. PW-3746, Electrical World.

Electrical Gen. Foreman, Age 36. All types of elect. installations. Speak Spanish. Excellent ref. PW-3782, Electrical World.

Electrical Engineer, thoroughly experienced as sponsor engineer on large high and low voltage power installations for leading eastern electric utility. Age 36, author and co-author of several technical papers. Prof. Eng's License (Pa.). Advanced engineering credit and proven supervisory performance. Excellent personal, academic and business references. Present salary $10,900. PW-3755, Electrical World.

Utility Engineer. Thoroughly experienced in construction, inspection, operation and maintenance of power plant equipment. Desires opportunity in power plant supervision or steam production engineering. 1931 graduate mechanical engineer. Married. PW-3780, Electrical World.

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- Plan & Profile for Transmission Lines
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Investigations, Valuations and Rates
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Steel Tower & Wood Transmission Lines
Distribution & Maintenance
175 Endfield St. — Hartford, Conn.

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New York 22, N. Y.

ASSOCIATES INC.
Consulting and Design Engineers
209 E. Washington
Jackson, Michigan

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Engineers
Design—Construction
Transmission—Distribution Lines
Reports—Valuations—Rates
New York — PHILADELPHIA — Chicago

DOBLE ENGINEERING COMPANY
Electrical Insulation Engineers
Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications
Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr., Chicago, Ill.

ELECTRICAL TESTING LABORATORIES, INC.
Electrical, Electronic, Environmental, Photometric and Chemical Laboratories, Testing, Research, Inspection and Certification.
2 East End Ave. — New York 21, N. Y.

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Consulting Engineers—Designers—Constructors
Steam, Hydroelectric, Gas-Turbine & Nuclear Power Generatoin—Electric Transmission & Distribution Systems—Power Surveys, Reports & Contracts—Industrial, Transportation & Communication Facilities—Water & Waste Treatment Works.
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BUSINESS AND ECONOMIC RESEARCH
READING, PA.
Washington — New York

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Consulting Engineers
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Flood Control, Irrigation
River Basin Development
400 West Madison Street — Chicago 6

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Erection and Maintainance of Electrical Transmission and Distribution Lines
1384 Holly Avenue, Columbus, Ohio

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Surveys—Appraisals—Reports
Machine Design—Technical Publications
Boston — Washington — New York

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Depreciation Studies—Property Records
Cost Trends—Special Studies—Reports
for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Michigan Theatre Building, Ann Arbor, Michigan
NOrmandy 8-7778

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Piping System Flexibility Analyses
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Pittsburgh 22, Pennsylvania

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Investigations, Reports, Appraisals
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Mount Vernon, N. Y.
MO 4-7117

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Broadway 9-3000

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READERS MAY CONTACT
the consultants whose cards appear on this page with the confidence justified by the offering of these special services NATIONALLY.

The Meetings Calendar

MARCH

Southern Safety Conference—Robert Meyer & George Washington Hotels, Jacksonville, Fla., March 6-8.

American Society of Mechanical Engineers—Gas Turbine Power Division & Hydraulic Division, Rice Hotel, Houston, March 6-9.

Fifth National Electrical Industries Show—New York Coliseum, New York City, March 6-9.

1960 Electric Meter School — Sponsored by University of Tennessee and Mid-South Metermen's Association, University of Tennessee campus, Knoxville, March 7-11.

Southeastern Electric Exchange—Accident Prevention Committee Joint Meeting with Personnel Administration Section, King Edward Hotel, Jackson, Miss., March 10-11, Annual Conference, Boca Raton Hotel & Club, Boca Raton, Fla., March 21-23; Directors Meeting, Boca Raton Hotel & Club, Boca Raton, Fla., March 23.

Pennsylvania Electric Association — Purchasing Committee, Philadelphia, March 14; Customer Contact Committee, Pittsburgh, March 16; Street & Highway Lighting Committee, Pittsburgh, March 17; Personnel Practices, Philadelphia, March 24.

National Association of Corrosion Engineers—16th Annual Conference and 1960 Corrosion Show, Memorial Auditorium, Dallas, March 14-18.

Edison Electric Institute — Industrial Relations Committee, Mayflower Hotel, Washington, D. C., March 17-18; Area Development Committee, Atlantic City, March 31.

Rocky Mountain Electrical League—Electric Meter Institute, Engineering Department, Denver University, Denver, March 20-25.

Wood Pole Conference—Oregon State College Campus, Corvallis, March 21-22.

National Electrical Manufacturers Association — First National Electric House Heating Exposition, Sherman Hotel, Chicago, March 21-23.

Canadian Electrical Association—Western Zone, MacDonald Hotel, Edmonton, Alberta, March 21-23.

Institute of Radio Engineers—National Convention, Coliseum & Waldorf-Astoria Hotel, New York City, March 21-24.

Oklahoma Utilities Association—Accounting Section, Biltmore Hotel, Oklahoma City, March 23; Association Convention, Biltmore Hotel, Oklahoma City, March 24-25.

Electrical Industry Show & Lighting Exposition—Sponsored by Electrical Maintenance Engineers Association of Southern California, Shrine Exposition Hall, Los Angeles, March 23-26.

• **Tennessee Valley Public Power Association**—Annual Meeting, Andrew Johnson Hotel, Knoxville, March 28-29.

American Power Conference—22nd Annual Meeting, Sherman Hotel, Chicago, March 29-31.

• **Pacific Coast Electrical Association**—Engineers & Operating Meeting, Hotel Claremont, Berkeley, Calif., March 31-April 1.

APRIL

• **Maryland Utilities Association**—Spring Business Meeting, Lord Baltimore Hotel, Baltimore, April 1.

• **Sixth Nuclear Congress**—New York Coliseum, New York City, April 3-8.

• **American Institute of Electrical Engineers**—Southwest District Meeting, Houston, April 4-6; East Central District Meeting, Charleston, W. Va., April 12-14; Paper and Pulp Meeting, University of Florida, Tallahassee, April 21-22; Great Lakes District Meeting, Milwaukee, April 27-29.

• Additions this week.

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New Exide Silicon Charger. Today's most advanced charger development. Silicon diodes never grow old. You get new economy, new low upkeep, new long charger life. New automatic equalizing charges. Sizes for all standby battery applications.

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the KUHLMAN 60

Get complete facts about ALL NEW revolutionary "Quick-Grip" from your local Kuhlman representative.

INTRODUCING THE

ALL NEW QUICK GRIP

The transformer bushing that reduces radio noise without oil

The new Kuhlman "Quick Grip" H. V. bushing offers revolutionary, positive reduction of radio interference. No oil is needed even at higher voltages. The bushing shank fits into a stress relieving ground sleeve normally used only with power transformer bushings. The sleeve's surface prevents any concentration of stresses that could cause radio noise.

AND HERE ARE MORE OUTSTANDING FEATURES:

1. **A new protective hand grip**—permits line connections without use of tools . . . gives full protection against service interruptions caused by birds and animals coming in contact with live parts.

2. **New conductor capacity**—with spring loaded terminal, accommodates a wider range of aluminum conductors as well as copper.

3. **New porcelain construction**—with heavier, sturdier skirts, provides ample creepage with less chance of breakage.

4. **New internal clamping**—eliminates all external hardware. The same stress relieving ground sleeve does the clamping. Its simple one-piece construction evenly distributes mechanical stress along the bushing shank and threads into the transformer cover, not the bushing.

5. **New Quick Disconnect**—disconnects the bushing without the use of tools. A simple quarter turn of the disconnect at the base of the bushing disengages the bushing lead, leaving the cover or bushing free for removal.

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Mich.

Manufacturers of transformers since 1894

FACTORIES: Bay City, Mich. • Crystal Springs, Miss. • Salinas, Calif.